Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-193-RC1, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Electricity savings and greenhouse gas emission reductions from global phase-down of hydrofluorocarbons" *by* Pallav Purohit et al.

Anonymous Referee #1

Received and published: 2 April 2020

The authors discuss the emissions of HFCs under several scenarios, with and without the controls of the Kigali Amendment. The novel aspect is that they not only consider the direct climate effects, but also the indirect effects, through changes in the energy use and related air quality aspects. The paper is scientifically sound and the results are interesting and policy relevant. The presentation of the results, though, needs to be improved. There are too many figures with too many panels and lines, which makes it hard to get the main message. The abstract also needs more focus on what is new and not presenting results that have been shown by others also before. I think the paper is acceptable for publication in ACP, after the presentation has been improved.

Main comments: The abstract needs more focus and needs to be shortened. Focus the abstract on what is new (energy savings and air quality aspect), not on results similar to those that have been presented in papers already before. The results on avoided HFC emissions are presented in the conclusions (section 5) and don't need a prominent place in the abstract. The paper contains too many figures; they distract the reader from the main message. Most figures also contain a lot of lines which makes them hard to read and to get the main message out of them. Figure 3: two panels as an example is enough, the rest can be put in the SI. Figure 4 is not needed, since Figure 5 shows the same information in a much clearer way. Figure 6: is this figure needed, if yes, reduce the number of lines. Figure 7 is good and clear. Figure 9 is not readable, too many panels and too many lines. Replace with one clear figure and move the rest to the SI. Some figures also need larger legend. The paper contains a lot of acronyms which makes it not easy to read. The authors should try to avoid acronyms when they are not needed and mostly spell them out in tables and figures, or at least explain the acronyms in all the captions of figures and tables.

Specifics comments: L10-24: These lines in the abstract could be shortened significantly. Only at L24 new information is presented. In L24-29 I would also mention the effects of the economic vs technical mitigation potential. This is a very important and policy relevant result. L11-12: HFCs are not the primary substitute for ODSs under the Montreal Protocol. In many applications ODSs have been replaced by not-in-kind substitutes, such as in cleaning and foam blowing, while hydrocarbons have been used in large quantities in small refrigeration units. I would write "They have been used in large quantities as. . ." L33: ". . .and emissive use'. Maybe better to write ". . .and use as refrigerant" L40: Spell out HFO when it is first mentioned. L45: Please specify the composition of the party groups in the main text (or footnote or caption). Now it is only specified in the SI. Also, the word 'group' is confusing and Group I and group II even more so. In the Protocol groups are defined in Annexes as a set of chemical species. A suggestion: use A5 group A, B, nonA5 group A, B. L115-119: SSP3 is selected as primary scenario and SSP1 as a sensitivity case. I find the logic not

very convincing. The largest differences between in all SSP scenario (1 to 5) occur after 2040 and more even later, so that fact that SSP3 is closest to the IEA scenario up to 2040 is not a very strong argument. So if you select SSP3 as primary scenario than use the highest and lowest of the SSP scenarios (I guess 4 and 5 in your case) for sensitivity. They show the range of results, especially for the second half of this century. Clearly, under the KA they all collapse on to one curve. L180: What do you mean with 'HFC removal efficiency'? To me it could mean, replacing HFCs with other substances or NIK technologies, but also HFC capture and destruction. L181: Again, what is 'removal of HFCs'? I also don't understand the rest of the sentence. 'removal of HFCs is close to complete. . .not affect conclusions regarding the HFC phase-down'. If removal is complete does that mean the phase down is complete? Please clarify this sentence. L218-219: 'no information . . . was provided . . .' This is an odd argument. Improvements in MAC are clearly taking place, although maybe not directly related to energy efficiency. How it will effect CO2 emissions and air quality is a completely different study and I can understand that that is the reason it is not taken into account here. I would rephrase the sentence. L232-233: 'The electricity generation units. . .'. Please specify what units will be used first. I can imagine that this is different in different countries. What did you assume? L277: What is meant with '. . .at least to a limited extent.' This weakens the rest of the sentence considerably. L289-294: I agree with this paragraph, but it would be good to have a reference for it. L289: Be careful with the term low-GWP alternatives (see my comment with Table 2) L345-347: You have to mention somewhere that in, e.g., the EU, Japan, Australia HFC regulations are already in place and preceded the time the KA came into force. The situation in the US is complicated. L348: Very useful paragraph. The corresponding figure (3) needs to be simplified (see below). Have the national/regional regulations that are already in place been taken into account here? In the EU for example the phasedown of HFCs is already well underway. L436-440: There are many acronyms in section 4.3.3. Please spell out CPS, NPS, SDS. This makes it easier to read. L783: Figure 3: Simplify this figure by moving panels to the SI. The message comes much better across with only

two panels. L790: Figure 4 shows negative numbers for savings. I think this is confusing. Or 'savings' or negative/reduced electricity use. In also Figure 5 where positive savings are shown. L800: Same as in figure 4. Confusing to show negative emission reductions. L805: Same as figure 4 and 5 L810: Figure 8: Very unclear: too many panels and too small numbers. This figure has to be improved. Table 1: I think the table can be simplified, since almost all scenarios have an 'X'. L815: Table 2: HFC-32 is mentioned here as a low GWP alternative. This is confusing. There has been a lot of discussions in among parties to the Montreal Protocol on the term low-GWP. A value of 150 is sometimes considered 'low' because it is a value used in the EU regulation. HFC-32 is not considered a low GWP alternative. It is used as an alternative with a 'lower' GWP than the compound it replaces. Please use the terms 'alternatives' and 'low-GWP' carefully.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-193, 2020.