Review of paper by Purohit et al.

This is a very nice paper and it is timely. The calculations use the well-established GAINS model and uses various assumptions, most of which are documented. The paper shows that the use of low GWP substitutes (including non-fluorinated refrigerants) for the high-GWP HFCs along with efficiency gains in better equipment design would help reduce climate change. This occurs through the reduction in the lower greenhouse effect of the substitutes and lesser CO2 emission from lower electricity usage.

The main concern I have about this paper is: Is ACP the right venue for this paper that is mostly about economic analyses and non-atmospheric assumptions. I have debated this for a few days and came to the conclusion that it would not hurt atmospheric scientists to read this paper to understand factors that go into decision making and the level of knowledge about the atmosphere that is used in such decision making! It should be eye-opening to them. I will leave it up to the Editor to make this call on suitability. But, I stand on the side of publishing it here!

I have a number of comments for the authors to consider, some are small and some are more important. I list them below.

Very major comment:
Personally, I don't think that there should be policy recommendations. I would cast the same recommendations as options and the gains made from such options. Policy recommendations do not go too well in science papers!

Major comments:

1. The future warming is not the same across the globe. There are major regional and latitudinal differences. Also, the mean temperature is not what determines the use of cooling. It is the changes in the high temperatures. Do you account for these factors in your analysis? If you do not, you should explicitly state it and point out the uncertainties that you get from such an assumption.
2. I actually agree with your choice of baseline. But, you need to discuss at least briefly how much difference it will make going forward. We are already in 2020!
3. How sensitive are your calculations to the assumption the efficiency gains made from switching from CFCs/HCFCs to HFCs is translated to going from high-GWP HFCs to lower GWP substitutes? Is there an upper limit to the efficiency gains that can be achieved? Does this efficiency gain take into the change in the thermodynamic efficiency loss due to higher temperatures (not the global mean, but the location dependent predicted high temperatures)? Can this efficiency be improved if particular attention is paid to this factor? It would be nice to see something discussed here.
4. Can you make some comments about the gains made if renewables were used? Afterall, you are projecting to 2100!

Minor comments:

1. Not all HFCs are very potent greenhouse gases. You need to qualify your statements.

2. Your quoted GWP is for a mix of HFCs. You need to state this. Also, I think you are using 100 year GWPs, which are not necessarily appropriate since most HFCs have much shorter lifetimes and hence their shorter horizon GWPs are larger. How does that affect the near term gains/disbenefits?
3. Somewhere in your model you have a specific fuel mix used to generate electricity. It would be useful to explicitly state those.
4. I am impressed with your citation list! You are very comprehensive!
5. Have you considered that aerosols offset GHG of CO2? This happens only up to a point and then it does not. This influence can have major influences in the future. (See Murphy and Ravishankara, PNAS, 2018).
6. I am sorry to say that your figures are not easy to read, especially if somebody is partially colorblind. The lines are impossible to see, the axes are rather poorly formatted and too numerous to see. I assume (hope) that you will improve all your figures.