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Interactive comment on "The impact of uncertainty on optimal emission policies" *by* Nicola Botta et al.

Anonymous Referee #1

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General comments

I find the overall approach taken in Botta et al. (2017a,b) very innovative and I am happy to see an application thereof. The current paper considers an interesting and important question. In the following, I provide several suggestions that might improve/clarify the paper.

0. In the context of optimal emission policies, I wonder whether the model of a single decision-maker being concerned with the dynamic implementation of policies is the most relevant setting. It seems that the overall coordination problem could be much more important. There are of course applications, where the single-decision maker being concerned with the dynamic implementation and its consequences is critical: For instance, nuclear power clearly has a key time dimension for the sequence of moves;

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so have other economic policies such as competition policy. In both cases, arguably a single decision-maker has a lot of influence on the overall policy. It is not clear to me whether this is the case for global emission policies and it should be argued more forcefully by the authors why it is relevant.

1. More importantly though, one can also turn the question in 0 around and ask: Is this actually the adequate framework to consider the question at hand? It is in principle possible to consider dynamic game theoretic models to discuss the timing of actions *and* their strategic interrelation. There can be good reasons not to follow this path here but it should be made clear why.

2. To me a distinguishing feature of the current approach is its focus on correct implementation. I consider this aspect to be of great importance and often neglected in policy advice (and in academic work as well). Why is this important for the particular problem at hand?

3. Overall, I am left wondering what the exact contributions to the literature is. I am fully aware that, working at the intersection of different fields, making this clear to researchers from different backgrounds is hard. I may miss the obvious - not being familiar with certain aspects of emission policy research - but I would still urge the authors to be more concrete about this.

4. I find the scattered comments on the different aspects of the papers Botta et al. (2017a,b) rather confusing. An alternative could be to have a section where the necessary information from the previous papers is summarized; then followed by the application of this paper here. It may also help to have a technical appendix where the key ideas are summarized.

Specific comments

0. The introduction states as a key result that different kinds of uncertainty can be distinguished. This is vague. How do these different kinds of uncertainty differ precisely?

Do they refer to the different nature of uncertainty, i.e. a distinction of probabilistic versus non-deterministic uncertainty? And in which sense can this framework "seamlessly" deal with it (see also point 2 below)?

1. Section 2.2. describes the reward function. I find this discussion hard to follow; again a more systematic introduction of the tools of the previous papers would be helpful here. An alternative could also be to describe the decision problem as a sequence of payoffs, which the decision-maker seeks to maximize, and then turn to the control theoretical perspective of viewing this as a step-by-step process.

2. Section 5 analyses the effect of different types of uncertainty. This looks rather ad-hoc to me as it is unclear in which sense the derived conclusions ("implementability risk is more important") are driven by particular parameter choices. What is the argument that it is a robust result? What about a more systematic approach including a sensitivity analysis?

Technical corrections

Typos:

p. 10, l. 6 "the the"

p. 10, l. 25 "Ionescu Inonescu"

p. 12, l. 24 "Without losT of generality"

p. 14, l. 24 "in termS of"

p. 20, l. 29 "explained:the

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