The authors wish to thank the reviewer for their very detailed and thorough review of the submitted paper. It’s clear you have a keen interest and knowledge in this area, and we greatly appreciate your feedback and recommended improvements. At the outset, this paper was uniquely challenging to write given it will be published in the public domain – the parent work that our paper is based on has security requirements and as such much of our work is classified and not permitted to be published. Thus, to ensure no sensitive information is made public, we deliberately used generic and broad descriptions of the security threats, and as such, apologize for any areas that we are unable to expand or provide greater detail. Comments that have addressed and incorporated into the revised paper are provided in Blue font, while those comments in Red font are the authors rebuttals and are not reflected by changes within the paper.

This is an interesting and valuable paper that seeks to fill an identified gap in the scientific literature – the vulnerability of passive safety systems to sabotage. The authors have developed a methodology to score the credibility/probability of different events and their consequences based on expert judgement. They have then produced a list of ten sabotage events that could negatively impact on passive cooling systems and described each of these. They conclude by recommending that SMR developers consider these potential events as part of their safety/security design activities.

Track suitability: My understanding is this paper is currently within track 10. The paper concerned with security event impacts on what are currently seen widely as purely safety systems, so it does relate to interfaces but it does not really address them.

**Main suggestions for improvements:**

1) The paper has no references. Whilst much of it seems to be the authors’ own work, it lacks any evidence that links it to the existing literature, despite claiming to fill a gap. References would also be helpful in supporting claims such as the use of various passive safety systems listed in the second paragraph of the introduction, which are named but not explained – a reference would obviate the need for such explanations. References added

2) The first part of the methodology is not explained in sufficient detail and there appear to be mistakes in the wording that obscure the meaning. For instance, you say “to assign metrics for the credibility and realistic nature” – this seems a strange phrase and it left me trying to work out what you were saying, rather than helping me understand. As with my prior point, this includes no references – you say that you draw upon a range of analyses, models, and testing, but none of this is cited, even to provide indicative examples of your most useful sources. This is perhaps explained in the third paragraph, which I suggest might be summarized as “just trust us, we are experts”. This is not the foundation of good scientific reasoning or evidence – it is opaque to the reader. Failure modes and security risk assessments are not welly characterized for passive decay heat removal systems – this is a very new area for risk assessment and as such there is little quantitative sources to draw from. No works to date have published detailed security assessment of this specific topic area. Thus, our metrics were assigned based first on scientific knowledge of the operating behavior of these systems, i.e. how they behave when they fail, and then assumed methods for deliberate sabotage.

3) Your tables are helpful, but I would suggest that the differences between levels 1 to 5 remain highly subjective. For instance, in Table 1 the main difference appears to be if the event is, e.g., not likely, possible, likely, or highly likely. The meaning of these terms is highly subjective, and if the analysis were to be performed again by a different group of experts there is a good chance they would reach a different conclusion due to this. There is a similar issue in table 2 with similar adjectives being used for each level. If you had some way of making these more concrete and less subjective, I would recommend you at least indicate this, and ideally share it. The work performed was based on high level, broadly grouped degrees of severity for the purposes of prioritizing threats for further evaluation. Our focus is not providing detailed quantitative descriptions of failure consequences, given this work is first of a kind and the possible security threat scenarios exceed 200+ scenarios.

4) It is not clear how the two scores from tables 1 and 2 were combined to reach an overall risk score, or if this was done, though my assumption was that you had combined them in some way to produce an overall risk score as the basis of your prioritized list of potential sabotage events. This is linked to the following point. Description added on derivation of risk from credibility and consequence.

5) It is not clear how the methodology was used in generating the list of failure modes, or if these were generated independently by, e.g., a brainstorming process between you as a group of authors. When you then go into each one in more detail, you could have presented the two scores from tables 1 and 2 for each – this would have better linked your methodology and results. This level of detail is included in our full reports but necessitates simplification for this IAEA paper.

6) I would recommend providing some references or bibliographic sources to support your failure mode hierarchy section – some of this is specific thermal-hydraulics knowledge that not all readers may be able to engage with without some additional guidance, especially at a very broad conference covering all aspects of SMRs. References added.

7) The list you have could benefit from slightly more detail to explain the failure modes as some are overly broad here compared to how they are described in the subsections below. For instance, “foreign materials” – what types of materials, and what about them? You go on in section 3.7 to explain you mean dust, steam or smoke between the vessel and cooling channels, a much more specific scenario. This level of detail is included in our full reports but necessitates simplification for this IAEA paper.

8) Is this list in any kind of order? They do not appear to be, e.g., prioritized based on the level of associated risk, which is what I had assumed you would do based on the methodology section before. There is no order to the list.

9) Perhaps this is intentional, but you don’t have a subsection for item 9. Section 3.9 relates to list item 10, and there is no 3.10. This error has been corrected.

10) In several of your subsections in section 3, you say that the attack would be readily detected, but you do not mention prevention or mitigation as much – you may want to say more about this, but I leave that to your judgement. These considerations are outside the scope of the paper focus.

11) Subsection 3.1 – you say a significant quantity of contaminants would be required, but this may not always be the case, and indeed there may already exist a material capable in small quantities of converting or otherwise impacting a large volume of coolant. Added verbiage to distinguish between chemical and non-chemical contaminants, the former of which may have impactful effects even with low quantities.

12) Subsection 3.2 – you say it could have minor consequences. Is this true wherever the blockage occurs? Added verbiage that single blockage is more likely to have only minor consequences, given the redundancy in design of typical passive decay heat removal systems.

13) Subsection 3.3 – you talk about coolant freezing, but not coolant evaporation, despite the header of “change in physical state”. If you do not consider this credible, it might be worth making that explicit. Added scenario describing coolant evaporation.

14) Subsection 3.5 – you say that placing a high energy device requires proximity, but this seems to ignore the possibility of both standoff attacks and remote emplacement, e.g., by drones. Additional narrative was added for this scenario.

15) Subsection 3.8 – I would question whether the likelihood of plane crash is truly low, as the existing measures you listed, to me, do not really seem sufficient to reduce the probability of this risk. That is just my view though, and you may disagree. Below you refer to the “assumed small size” of the impact – why is this assumption valid? Access to large commercial planes was specifically excluded in our assumptions of saboteur capabilities. Though one may argue the credibility of this scenario, in our modern age it’s very unlikely that a small team of saboteurs would be able to take control of large commercial planes, instead small aircraft would be more credible. The authors needed to establish a threshold cutoff for what could be done, and this specific case was the cut-off.

On the next page you say “water systems…features two parallel networks” – this needs a reference or some justification for this claim. The authors are purposely not referring to any specific vendors or design under consideration for security purposes. A familiar reader will have awareness that nearly all the planned water based passive heat removal systems feature parallel networks. However the reviewer makes a good point, we have revised the statement to say “two or more parallel…”

16) Subsection 3.9 – you mention it is unlikely that a design will have a single dump valve at the lowest point of the coolant system, but a “freeze plug” doing this job is exactly what molten salt reactors plan to use as a major element of their safety case. The authors do not believe this is a valid analogy, the dumping of a water passive decay heat removal system removes the heat sink of a decay heat removal system, allowing the system heat to increase, while dumping of a molten salt pool transfer the heat generating fissile material to a larger volume where a chain reaction cannot occur and thus the system heat decreases.

**Minor editing suggestions:**

**Title:**

Is there a missing word at the end? I know what you mean by “advanced nuclear” but not sure it is suitable for a conference paper title – advanced nuclear what? Corrected

**Abstract**:

Word 4 should be modular, not module. Corrected

Line 3-4, I would suggest putting commas before and after “in some advanced reactor designs”. Corrected

Line 6 you say, “radiological sabotage” – this is an NRC term that is not necessarily understood by non-US audiences, you might be better to say, “sabotage of nuclear facilities”. Corrected

Second paragraph, second-to-last line you should change “findings by” to “findings of”. Corrected

Last line, the "this" at the start should be a "the", according to IAEA formatting style. Corrected

**Introduction**:

I suggest you define what is meant by “passive methods of cooling” and how these differ from active methods used commonly today – all readers might not understand this.

At the bottom of the first page, you might have a double space within your sentence, after “challenges” – you might want to check through and eliminate any unintentional double spaces. Corrected

**Method**…:

The first half of the first paragraph feels like it might sit better within the introduction than here. The second half of this paragraph is not clear and would benefit from revisions to improve this.

Second paragraph Line 1, you seem to use “quality” as a verb, please check this. Corrected to qualify.

Line 2, I would suggest that you add “probability/” before credibility (as in the top row of table 1) to aid reader understanding. Corrected

Third paragraph you seem to use the word “ranking”, but I would suggest “scoring” – to me, ranking is the process of putting some items in an order, whereas scoring is assigning them values which could then be used to produce the ranked list of items. Corrected

**Failure mode hierarchy:**

Line 6 you say “catered to…” which seems like an odd word choice and left me confused as to what you were trying to say. The list of items seems perhaps unnecessary given the list of headers below but would make sense to me as a table with the 10 items, and then the credibility and consequence level scores for each.

**3.5 Energy flow**…: Fourth word missing an “r” at the end. Authors are unable to locate this error?

Second line you say, “this could entail interior chambers…”, I might suggest another revising as “this could entail” left me a little confused at first. Corrected

Section 3.9 is missing – current 3.9 should presumably be 3.10? Corrected

**Conclusion**: Last sentence you say “discerning”, but I might suggest “deprioritizing”. Corrected