The revision of the paper:

TRANSMUTATION EFFICIENCY OF MINOR ACTINIDES IN FAST-AND THERMAL-SPECTRUM MOLTEN SALT REACTORS

**Review General Response**

We would like to thank the reviewers for their detailed assessment of this paper. Your suggestions, clarifications, and comments have resulted in changes which certainly improved the paper.

**Reviewer #1**:

1. Paper clear and concise, it is echoing another paper presented in ANE. Nothing much to say, the quality if correct and the results are acceptable.

Thank you very much for these comments.

**Reviewer #2**:

1. Burial=disposal  
   Thank you for the excellent point. Done.
2. "There are several parameters that describe the efficiency of MA transmutation....It is clear that there is no consensus on a single numerical criterion describing the efficiency of MA transmutation, although this would be highly desirable....." The so called D-factors and equilibrium method are not mentioned. Please, have a look on "Self-Sustaining Breeding in Advanced Reactors: Comparison of Fuel Cycle Performance", certain quantification is proposed there and it may be easy to apply also in this paper.

Thank you very much for this comment. We appreciate your detailed review, which has certainly improved the paper. We totally agree with you, and we added this in the revised paper and we cite the mentioned paper (Self-Sustaining Breeding in Advanced Reactors: Comparison of Fuel Cycle Performance)

“Other parameters like D-factors and the equilibrium method are described in detail in [8].”

1. SD-TMSR = MSBR from ORNL? or Amster concept from EDF? Please include a reference.

Thank you for your insightful comment. In fact, SD-TMSR is based on MSBR and MSFR. A reference No 9 is added in the revised paper.

1. "A NEW APPROACH TO LOADING MINOR ACTINIDES..." the approach is based on central channel filled by MA carrying salt. There is neither graphic nor dimension of this channel. Also the wall material is not mentioned together with its foreseen lifespan in the central core neutron flux.

Thank you for catching this. The central channel has a volume of 40.84E+3 cm3. The wall material is made of graphite and its foreseen lifespan is about 30 years. This now appears in the revised paper.

1. There is central channel and Pu+U tank and FPs tank. But it is not obvious what is the treatment or actually inward outward flow of materials from these volumes. MA injection is not sufficient. 11.8 min cycle time is named. Is it valid for core or for the channel? Gaseous FPs are removed by 30s period. This number is often used in literature, but I have not seen just a single paper justifying it. Please include a reference where you get it from and have a look where the reference obtained it...!

Thank you for your insightful comment. A reference No 9 is added in the revised paper.

1. Irradiation of MA for 4 years and then storing them is weird. Do you plan to process the central salt at all? Please make the description clear. It seems that the fuel salt is continuously treated, but the central channel not. If so, you are modelling once-through transmutation in MSR. But MSR has a capability to transmute in closed cycle. What is the justification for this choice?

In this work, 241Am was continuously loaded into the central channel of SD-TMSR and SMSFR from an external storage at the same feed rate 3.55 g/day. We irradiated 241Am for 1500 days (≈ 4.1 years) in the central channel of both reactors. Additionally, we modeled two separate tanks; *Pu + U tank* and *FPs tank*. The first tank is used to store Pu and U isotopes extracted from the central channel. The second tank is used to store all fission products generated during the transmutation process in the central channel. Pu, U, and soluble FPs were extracted from the central channel by chemical extraction. Thus, the system cleans a certain amount of liquid salt daily. In this work, the effective extraction time for Pu, U, and soluble FPs ≈ 11.8 min, which is equivalent to a chemical processing rate of 5 m3/day selected in [9]. All gaseous FPs and undissolved metals formed during transmutation in the central channel were removed to the *FPs tank* within 30 s [9] through a gas bubbling system. So the fuel in the central channel is also treated.

The proposed approach combines the advantages of both homogeneous and heterogeneous approaches. In more detail, the proposed approach:

1. Allows loading MA in the centre of the core, where the neutron flux is high;
2. Aims to prevent contamination of the main fuel cycle with MA by closing the central loop;
3. Allows MA to be injected continuously and at a low rate (<4 g/day in this study) in order to avoid changes in the neutron spectrum in the core; as well as
4. Allows the extraction of Pu, U, and FPs, which negatively affect the behaviour of the core during operation.
5. Generally, logarithmic scales in all figures are hard for comparison, unless there is order of difference. Please consider a ratio for two comparable properties. For radiotoxicity in the Pu-U tank, once again it is not obvious what does it mean. Is there discharged fuel salt after some irradiation or are there nuclides removed during reprocessing? Make clear that operation time is given. 4 years...?

Please, see response on point 6.

1. I consider myself an expert in the field and I have difficulty to grasp the messages, please try to increase the clarity. Generally you are right that there is no solid stabilized methor for transmutation capability evaluation. But once-through irradiation in MSR seems to me like wasted potential.

Really sorry for that. We tried to increase the clarity in the revised version. Once again thank you very much for this comment. We appreciate your detailed review, which has certainly improved the paper. Please, see response on point 6.