Dear authors, please see below the comments from the peer review:

Reviewer 1: Thanks for this very interesting paper! The paper exposes the process of multiscale/multiphysics tool development at NRG quite clearly. Please find a few questions/comments/remarks below :

§2.1: please clarify that the time scheme used for these first coupling efforts was explicit (compared to the MyMUSCLE tool presented later in §4) Adjusted text.

fig. 1 : in the right sub-figure, it seems that temperature information flows "both ways" between STH and CFD, while flow information (flowrate/pressure) only goes from STH to CFD. Has this lack of hydraulic CFD -> STH "feedback" caused any difficulty in the PHENIX and CIRCE cases? Does myMUSCLE allow for improvements in this area? For CIRCE it did not cause any difficulty as the CFD side basically is one large pool with one inlet and one outlet and with the mass flow rate mainly determined by the pump mock-up inside the inner loop. For the Phenix case, there is hydraulic feedback from CFD to STH, viz. mass flow rates leaving the IHX. However, for most cases, having hydraulic coupling both ways, such as mass flow rate one way and the pressure the other way, is indeed preferred and this has been implemented in myMUSCLE.

pg 6, last paragraph : "For fast reactors" -> "For heavy liquid-metal fast reactors" (for SFRs, sodium has approx. the same density as water) Corrected

p11 §5 : "learns" -> "shows"? Corrected

Reviewer 2: A comprehensive overview of the multi-scale and multi-physics simulation activities very valuable in the nuclear field is done in this paper. Please find a few comments below: In Fig. 4 it would be useful to include the temperatures legend. A nomenclature section would be helpful. A review of the right justified in abstract and section 2.3 is needed. Corrected the right justified parts. Thank you for noting that. Also included a legend in Figure 4. Intentionally no nomenclature section was included to not make the paper too long, and also because none was requested according to the template. If it's desirable to include one, the authors happily oblige.

Reviewer 3: The paper deals with multi-scale and multi-physics coupling for fast reactors numerical simulation. First, applications using an ad hoc approach (new coupling strategy for each use case) are presented. Then, answering to the need to make the coupling more generic and robust, two new generic tools are presented.

The paper is easy to read and gives a good vision of the recent evolution of the multi-scale-multi-physics strategy at NRG.

I suggest minor modifications/comments:
- page 6 : At NRG, two different frameworks are used
- please provide some examples of time schemes/coupling algorithms implemented in myMUSCLE (implicit fixed point? ...)
- do you plan to run in the new tools the ad hoc tests presented in the first part?

Some more information on the coupling has been provided. As for the bottom question, since these cases were part of a benchmark exercises, probably they will not be re-done. That said, it could be an interesting exercise to do, so we may revisit them at some stage.

Dear authors, please submit revised paper addressing the minor corrections and comments above by 22 September 2022