Atom Indonesia Journal

Inter-Code Comparison of Computational VERA Depletion Benchmark Using OPENMC, OPENMC-ONIX and DRAGON

This research presents a comparative analysis of the Virtual Environment for Reactor Applications (VERA) depletion benchmark problem using open-source Monte Carlo code OpenMC, python-language-based burnup code system called ONIX (coupling with OpenMC), and deterministic DRAGON code.

Here are some comments:

It is very important to get the English edited very carefully. It is pretty difficult to understand some of the sentences.

Line 13. Typo: OpenMCis
Line 32. Typo: equations.Burnup
Line 35. Typo: equations..Chebyshev
There are so many typos in the manuscript which I am not interested in pointing out one by one. The Authors **HAVE TO** check the manuscript before submission carefully.

Line 40. Authors should give a reference for MCNP.

Line 59. Why do the Authors take OpenMC calculation as a reference result? Authors should take calculations originally from VERA calculation as a reference or, even better, from an experiment.

Line 86. How did the Authors determine the benchmark case? What is the basic or the physics of the problem?

Line 104. Depletion calculations were carried out using a power density of 40 W/gU and 40 burnup steps from 0 to 60 MWD/kgU for the depletion calculation. Why did the Authors choose this configuration? What is the reasons? Please elaborate.

Line 136. Legend of figure 1 should be in a circle. It is biased to the assembly configuration, especially for the purple one.

Line 213. Figures 3 and 4, what is meant by “difference”. The manuscript does not state what the “difference” is calculated against? Please explain.

Line 200.
How did the Authors split the UOX pin? is it have the same volume for each splitting area? Looking at figure 2, it seems that it is only based on the same number distance between each

of the splitting areas. So what is the basis for making this decision? What is the physical meaning of it?

Line 203. The authors say that three depletion intra-zones are enough to produce a converged solution for both OpenMC and ONIX, but in the case of DRAGON, at least five depletion intra-zones are required. What is the meaning of this statement? What is the meaning of "converged solution" in this context? Burnup calculation is a time-dependent calculation. If the Authors only look at the calculations at the end of a certain time period, then what about the calculations at the previous time? Would the authors say that the initial burnup time calculation is unreliable? for each calculation stage, the calculation should be convergent and trusted at anytime during burnup periods. If the calculation is considered not to be trusted in a certain time, then the calculation for the time after will surely can not be trusted.

Line 229. In the Introduction, the Authors stated that reference values are OpenMC results. However, the authors bring on the KENO-CE calculation results as a reference in the Discussion. It is not consistent. Please elaborate.

Line 215. Why is table 2 not list the ONIX calculation results?

Line 261. Figure 5 does not provide meaningful information because the codes' differences are covered by a wide range of keff values (between 0.8-1.2); meanwhile, the differences between the codes are very small compared to these values. Please provide more representative data to show the physical meaning of the calculation. The same comment applied to Figure 7.

What is the physical meaning of figures 6 and 8? Please provide more detail and relevant explanation considering the purpose of the present study?

Please provide a more relevant and detailed explanation of figure 9-25 that relates to and focuses on this research's purpose.

By reading this manuscript, the question arises of what is actually compared in this paper? neutron transport code? or burnup module? the author should focus on the parameters that have a significant influence on the comparison and not mix them up

Final words:

Although I appreciate the author's work, who has carried out calculations using three different codes, for publication of articles in academic journals, the originality and novelty of this paper are not sufficient and not significant.

If the Authors just want to show that the CRAM method can produce accurate calculation results in less time (as written in the Conclusion), then the original developers of the codes have proven this in their publications, with a more comprehensive calculation cases in testing the method.

If this manuscript wants to highlight the cases it counts, then the Authors have to present a very specific case that can explore the capabilities of the methods used in each of the codes. The Authors should not use a standard case such as the fuel pin and PWR assembly.

This article does not show sufficient originality and novelty for publication in scientific journals. If and only if the Authors can demonstrate and highlight the originality and novelty of their paper, then this article can be considered for publication.

Goodluck.