RESULTS

In this study, k_{eff} was examined for Zr-2 as clad and AmO_2 and AmF_3 as fuel rod. Figure 4 shows the k_{eff} value for 0.085-0.095% AmO_2 and AmF_3 fuel rod. The effective multiplication constant (k_{eff}) must $k_{eff} \leq 1$ in the designed BWR system to avoid the critical accident. Figure 4 shows that the k_{eff} value increases with the increase in the rates of AmO_2 and AmF_3 fuels. In particular, it seems that a reactor for 0.09-0.095% AmO_2 fuels in Zr-2 clad has reached the desired critical operating mode.

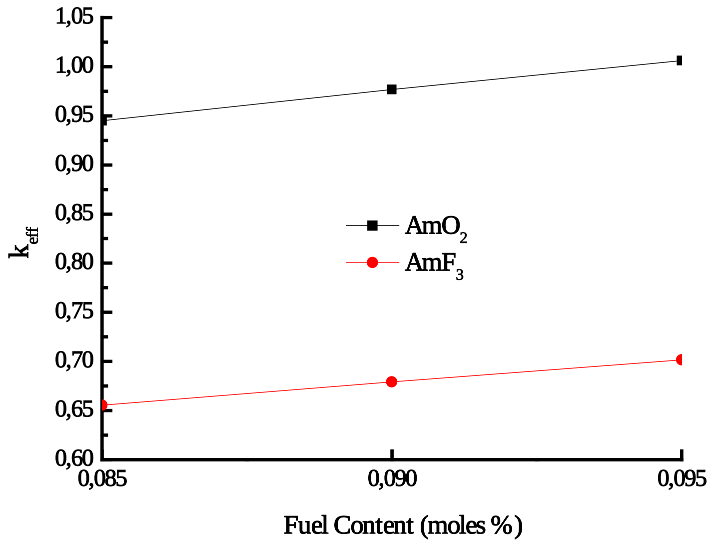

Figure 4. The k_{eff} values for Zr-2 clad, the fuel AmO_2 and AmF_3 in the BWR system.

DISCUSSION and CONCLUSIONS

In this study, a BWR system with 8x8 type square lattice is designed. Each square lattice was divided into small square lattices of 7x7 type, and 0.085-0.095% AmO_2, AmF_3 fuel rods with Zr-2 clad were placed in this small square lattice. In the study; k_{eff} were calculated for AmO_2, AmF_3 fuels and Zr-2 clad. In the designed BWR system, these neutronic calculations were made using the MCNPX-2.7.0 Monte Carlo method and ENDF/B-VIII.0 nuclear data library.

In the study, it was observed that k_{eff} value increased with the increasing rates of AmO_2 and AmF_3 fuels in Zr-2 clad. It was found that k_{eff} calculated with AmO_2 fuel were higher than AmF_3 fuel.

REFERENCES

Duderstadt JJ, Hamilton LJ., 1976. Nuclear Reactor Analysis. New York: John Wiley& Sons.

Fridstrom R., 2010. Response of The Gamma TIP Detectors in a Nuclear Boiling Water Reactor, UPTEC F10 042, ISSN: 1401-5757.

Loberg J, et. al., 2010. Neutron Detection-Based Void monitoring in Boiling Water Reactors. Nuclear Science and Technology, 164: 69.

Loberg J., 2010. Novel Diagnostics and Computational Methods of Neutron Fluxes in Boiling Water Reactors. Digital Comprehensive Summaries of Uppsala Dissertations from The Faculty of Science and Technology 715, ISSN: 1651-6214.

Ouahdani SE, et al., 2018. A temperature effect analysis of the KRITZ-1 benchmark based on keff decomposition and using the JENDL-4.0 and ENDF/B-VII.1 libraries. Prog. Nucl. Energ., 109: 121-129.

Zakova J, Wallenius J., 2013. Multirecycling of Pu, Am and Cm in BWR. Annals of Nuclear Energy, 58: 255.