This work aims to verify the correct implementation of an anisotropic grain boundary (GB) energy model for face-centered cubic (FCC) and fluorite materials in Idaho National Laboratory's phase field fuel performance code MARMOT. The model was recently implemented in MARMOT with the purpose of enabling higher fidelity simulations of UO_2 nuclear fuels. As part of verification, tests were performed to measure the energy dependence on misorientation of high symmetry GBs in an FCC metal (Cu). The energies of the [100], [110], and [111] twist boundaries result as predicted, as do the energies of the [111] symmetric tilt boundaries. However, the energies of the [100] and [110] symmetric tilt boundaries display an unexpected mirror symmetry about half the rotation period. Further investigations are required to determine the cause of this discrepancy. Possible reasons include an error in the MARMOT implementation of the anisotropic GB energy model.