A Charge Breeder is a crucial device of an ISOL facility, allowing post-acceleration of radioactive ions: it accepts an incoming 1+ beam, then multiplying its charge with a highly charged q+ beam as an output. The overall performances of the facility (intensity and attainable final energy) critically depend on the Charge Breeder optimization. Experimental results collected along the years confirm that the breeding process is still not fully understood and room for improvements still exists: a new numerical approach has been therefore developed, and applied to the description of a $^{85}\text{Rb}^{1+}$ beam capture by the plasma of the 14.5 GHz PHOENIX ECR-based Charge Breeder (ECR-CB), installed at LPSC and adopted for the Selective Production of Exotic Species (SPES) project under construction at INFN-LNL. The results of the numerical simulations will be described along the paper. The ion capture process of the incoming beams at different input energies has been studied for different plasma parameters, in order to finally get a physically meaningful picture of the charge breeding process. The results, obtained by implementing plasma models of increasing accuracy, very well agree with the theoretical predictions, showing the key role played by the plasma ion temperature. In addition, the model is now able to reproduce with high accuracy the experimental results obtained at LPSC within the EMILIE project, when including in the code plasma densities in agreement with density estimations published elsewhere.