Twisted involutions are important in the study of reductive symmetric spaces and symmetric $k$-varieties. In many cases, the twisted involutions of an algebraic group classify particular orbits of that group. It is possible to determine the $\theta$-twisted involutions algorithmically. This algorithm depends on a particular generating set. This algorithm has been proved to generate all twisted involutions for a group given the standard generating set. In this work, we focus particularly on $S_n$ and show that any generating set of $S_n$ can be used to generate all twisted involutions. (Received September 24, 2018)