We consider a recent result for the existence of infinite-volume marked Gibbs point processes and try to apply it to geometric models. At first, we reformulate a problematic assumption of the considered existence result and check that the theorem still holds. We use this result for the family of Gibbs facet processes (a special case of particle processes) and prove the existence for repulsive interactions. We find counterexamples for the process with attractive interactions and prove that the finite-volume Gibbs facet process in $\mathbb{R}^2$ does not exist in this case. We also study the class of Gibbs-Laguerre tessellations of $\mathbb{R}^2$. We cannot use the mentioned existence result in general, but we are able to prove the existence of an infinite-volume Gibbs-Laguerre process with particular energy function, under the assumption that we almost surely see a point.