The accuracy of a quantum wave packet simulation is limited by the quality of the potential energy operator that is used to perform the calculation. This potential energy operator must be known for all regions of configuration space accessible to the wave packet, and in principle inaccuracies in the potential energy in any region of configuration space can degrade the accuracy of a simulation in often unpredictable ways. For molecular systems, ab initio electronic structure theory can calculate the value of the potential energy to high accuracy at any given point in configuration space, but these calculations can be expensive. A naive approach of calculating the potential energy everywhere it is needed presents an insurmountable practical barrier to undertaking wave packet simulations for more than a couple of atoms. Using Gaussian basis functions and local expansion approximations can help, but constructing potential energy operators from ab initio calculations remains expensive. In this presentation I will discuss some options for making the most use of the electronic structure theory calculations that are performed, contrasting and demonstrating several strategies that include continuous (semi-)global interpolation.