**Case Study 1: Building 101, Philadelphia Navy Yard**

The simulation of Building 101 followed a similar progression as One Montgomery Plaza. First, an initial run was performed using a rough estimation of the relevant input parameters and no additional post-processing calculations. As Design Advisor assumes a rectangular building layout, a representative layout was calculated using the given floor plans and the building area and enclosed volume measurements from the envelope air tightness study performed by Camroden Associates [3]. The results of the envelope tightness study were also used to select an overall air change rate for the building. The main three floors, basement, and attic were each modeled separately to account for differences in glazing percentage and room height. As the building's windows are user-operable, Design Advisor's joint natural and mechanical ventilation mode was selected.

The second set of simulations made use of the knowledge gained during the One Montgomery Study. The changes included the addition of plug loads, AHU energy usage, and more realistic building scheduling and furnace efficiency. The simulated building layout was also remade to better account for the shape of the actual building. The main (north-south) section of the building was treated separately from the small lobby area on its eastern side. Airflow between the two sections was thus assumed to be minimal, based on the single door connecting the two. As the attic is "used only for mechanical and storage space" [4] and appears to have no windows, it was treated in its entirety as a high R-value roof for the main three floors. The basement continued to be modeled on its own (for a total of four simulations).

The overall simulation time for Building 101 was comparable to the time taken for One Montgomery Plaza: preparation of data for input (both before the initial run and between iterations) – 8 hours; input of variables – 5 minutes; simulation – 1 minute; post-processing – 2 hours. The results are presented below.

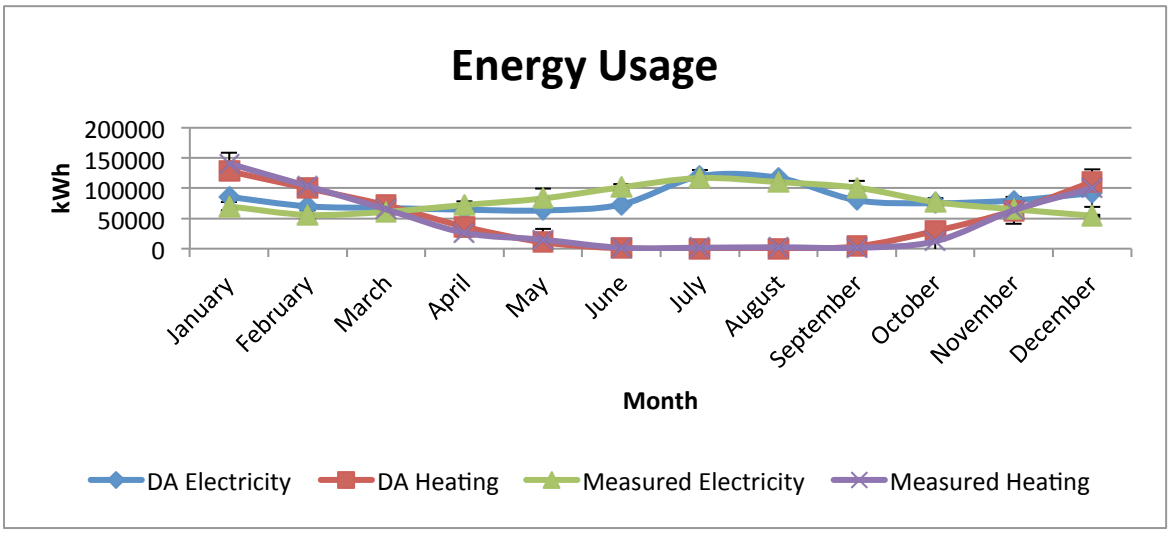


**Figure 1 Comparison of monthly heating and electricity (plug loads, lighting, and cooling) energy usage predictions to measured data for Building 101**

For the full year, the mean bias error of the combined heating and electricity usage predictions is 2.6%. The root mean squared error is 31.4%. On a monthly basis, the absolute error ranges from 1.2% (July) to 46.3% (December). The primary sources of error are the electricity estimates for December and the shoulder months of May, June, and September. This could be due to an overestimation of constant loads in the winter and an underestimation of lighting usage in the spring and fall, respectively.

Outside of these simulations, another significant achievement of the Design Advisor group was the successful porting of the simulation engine to Linux for the EEB Hub tools website. Currently, simulations only return monthly heating, cooling, and lighting energy requirements, but we plan to add the remaining functionality (as seen on the standalone Design Advisor website) in the near future.