

Abstract

Tracking energy flow can help building owners and operators gauge how and where buildings consume energy. Building Management Systems (BMS) and BACnet connectivity along with external asset and data management systems enable detailed visualization of a building's energy flows, which facilitates equipment and controls optimization to reduce energy consumption. This project uses Sankey diagrams—that allow for the visualization of varying energy flow quantities—to thoroughly portray energy distribution in an academic building before and after execution of air delivery energy conservation measures. Specialized Python tools and libraries enable processing data from the BMS to generate Sankey diagrams. The flow visualization demonstrates energy streams composed of a source and a terminal representing ways energy is distributed throughout the building. Air delivery systems contribute to heating, cooling, and ventilation, each representing multiple streams that flow through the building. This case study—informed by Sankey diagram visualizations—succeeded in optimizing the academic building's air delivery systems and in reducing energy consumption. Improved efficiency resulted from discharge air temperature and static pressure setpoint resets, indoor room temperature setpoint resets, and reduced unoccupied air change rates that optimized the use of air handling units, variable air volume systems, and fan coil units.