This study evaluated the power consumption of traditional and LED-based exterior lighting systems on passenger vehicles, examining nominal consumption as well as realistic consumption based on real-world usage patterns of various lighting equipment. The results indicate that an all-LED system employing the current generation of LEDs would result in general power savings of about 50% (nighttime) to about 75% (daytime) over a traditional system. The effect on long-term savings for the LED system depends upon the type of vehicle in use (gasoline-powered vs. electric). While the long-term fuel-cost savings (dollars) were higher for the gasoline-powered vehicle, long-term distance savings (range) favored the electric vehicle. Also presented are calculations of potential savings for two different scenarios of future improvements in LED power consumption.