In the United States, and increasingly the world, the automobile is indispensable to economic and personal mobility needs. Unfortunately, utilization of personal vehicles is currently entirely dependent on the combustion of petroleum energy sources. Consequently, cars are a major contributor to urban air quality problems, are the leading emitter of greenhouse gases in car-crazy societies like California, and rely on a diminishing supply of oil from geopolitically sensitive areas. As global demand for mobility continues to increase, new energy sources and new vehicle powertrains must be developed and commercialized that can both appeal to consumers and mitigate the environmental side effects of transportation.