SYSTEM INTEGRATION OF TRANSPORTATION—
DOING IT RIGHT FROM THE START

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Zero-energy buildings are just part of the equation for achieving “renewable communities”—or “renewable bases.” Transportation accounts for 28% of U.S. energy use and 67% of petroleum use (38% by cars and light trucks alone). In the near future, we predict electric vehicles (EV) and plug-in hybrid electric vehicles (PHEV) will offer the opportunity to meet transportation needs domestically and renewably. This opportunity meshes very well with renewable energy generation, the challenges of meeting electrical demand, and zero-energy buildings. An EV or PHEV with a 20-mile (more than half of the time, vehicles travel less than 20 miles in a day) or 40-mile (enough to get you up most any road climb) electric-only-drive capability can be plugged in for recharging at night when electrical systems have excess capacity. This helps even out the load for the utility, community, or base mini-grid. This also makes it easier for the utility or mini-grid to use the most cost-effective renewable energy sources such as wind turbines and biomass steam turbines that do not lend themselves well to use for peaking power—or in many places in the case of wind are greater at night when demand is lowest. As the nation evolves to a “smart grid,” we should plan our communities for optimized control and energy use. With a two-way electrical connection, also known as vehicle-to-grid or V2G, whenever the vehicle is not in use and parked at a residence or office, the electricity stored in the vehicle batteries can also be made available to help meet peak demand or provide emergency power in the event of a power outage. This further smooths out the demand curve, allowing smaller total generating capacity, and facilitating incorporation of wind and other renewable generation. And all the while that you are driving on electrical power, your “fuel” cost will be about one-third or one-fourth of what it would be if you were driving on gasoline power. As fixed operating budgets of “communities” are further stretched due to escalating costs, smart planning combining smart grid and advanced transportation will pay huge dividends, while reducing carbon dioxide emissions and petroleum dependence.