BMW electric concept car

Many commentators assume that if the federal government ever adopts a national policy to reduce greenhouse gas emissions, states and localities will largely take a backseat to federal regulators. But one highly necessary means to reducing carbon emissions — the electrification of the automobile fleet — will require active and involved participation by all levels of government, something that is often overlooked in policy conversations.

Two recent reports highlight the importance of electric cars to reducing greenhouse gas emissions. In *The Technology Path to Deep Greenhouse Gas Emissions Cuts by 2050: the Pivotal Role of Electricity*, researchers conclude that California cannot reach its 2050 goal of cutting emissions by 80 percent below 1990 levels without "widepread switching of direct fuel uses (e.g., gasoline in cars) to electricity." In other words, by 2050, California needs an almost entirely electrified passenger auto fleet to achive its goals (and a largely decarbonized electricity sector). In *The Future of the Electric Grid*, released today, MIT researchers propose a number of measures necessary to incorporate both renewable energy and electric vehicles into the electricity grid. The measures are aimed largely at the federal government and at utility pricing, recommending that the federal government be given greater authority to site transmission lines that cross state lines, even over local and state objections, and that utilities price electricity based on the "time-varying costs of supplying power" (higher rates for periods of higher demand). Both reports are important contributions to ongoing debates about how to transition to a low carbon energy economy.

Absent from the reports, however, is a focus on smaller but crucial — and very local — infrastructure changes that will be necessary to incorporate millions of passenger vehicles into the grid (this is assuming, of course, that other technological issues like battery range can be solved). These issues — spelled out in *Fleet Electrification Roadmap*, published by the Electrification Coalition — highlight how important states, utilities and local governments will be in any sweeping climate policy because even if the federal government mandates particular emissions reduction targets or efficiency standards, those standards will not be met without extensive local implementation and involvement. Here are just a few of the challenges:

- Households will need charging infrastructure in order to charge their vehicles

overnight. Virtually all observers conclude that the bulk of charging should be done late at night during offpeak hours in order to minimize the need for new electricity generation. Vehicles with a significant battery range will need what is known as Level II charging (220 volts), requiring the installation of "electric vehicle supply equipment," currently costing about $2,000 unit. But cost is not the only obstacle. Many jurisdictions require that the installation be permitted through the local building department — one current obstacle for potential Chevy Volt and Nissan Leaf purchasers is that the wait time for permitting can be months-long. Moreover old housing stock may not have the capacity to incorporate Level II equipment. The Los Angeles Department of Water and Power currently has generous incentive programs for the installation of Level II equipment and is working to reduce permit backlog. Its experiences may provide a roadmap for other jurisdictions.

- Apartment buildings provide particular challenges for the electrification of the fleet. Who should or will pay for the installation of Level II charging? Does each apartment need a separate charging unit? Currently, according to a recent presentation I attended, almost all electric car purchasers are homeowners, not renters, in large part because the charging obstacles in multi-family housing have not been addressed.
- What should be done about workplace charging? One problem with workplace charging is that for typical 9-5 workers charging will occur during peak electricity usage, which could create huge increases in the need for electricity generation. Yet some employees may commute sufficiently far that at-home charging is not sufficient or may face other obstacles to residential charging. Should employers be required to install 220 volt charging equipment? Should employees be charged for worksite charging? If not their incentive to charge during peak generation increases.
- Some neighborhoods may not have sufficient electricity infrastructure to support a large number of electric vehicles. The Electrification Coalition calls this problem the "utility impact of dense charge networks." If, as is desireable, electric vehicle owners charge their cars at night during offpeak hours, they may overload the tranformers in their neighborhoods and blow them out. Charging a car is apparently the equivalent of adding a new house to the grid. In order to remedy this problem utilities will need good data about electric vehicle usage and will likely need to upgrade local electric delivery systems.
- Building codes for new buildings and potentially for retrofits will need to be changed to require the installation of Level II charging equipment. In

California, for example, such equipment installation is currently only voluntary.

All of these questions raise classic and important questions about environmental federalism. Should the federal government set minimum standards for the electrification of the car fleet that require localities to provide the infrastructure necessary for the transition? Will states and localities respond instead to pressures from manufacturers of electric and hybrid electric vehicles to assist in the transition, particularly if these manufacturers are subject to strong fuel efficiency requirements? Should states and localities receive financial support from the federal government to ease the transition? How do we ensure that governments possess the necessary staff and expertise to make the necessary policy changes? How can we encourage information and experiential sharing in order to avoid regulatory duplication?

In short, passing national climate policy is only the first step toward a long and complex process to reduce emissions. If we don't pay attention to the small but crucial questions of who will implement climate policy we may never achieve any ambitious targets we set.