DANIEL SPERLING

Grounding the Electric Vehicle Debate

Much is at stake in the electric vehicle debate. On the one hand, electric-drive[1] vehicles provide far greater potential for reducing air pollution, greenhouse gases, and petroleum consumption than any other plausible transportation strategy or technology. But because these benefits are outside of the marketplace (meaning that government plays a pivotal role) and the technology is immature, the transition to electric-drive is uncertain. Those with the most at stake are large and powerful: the oil industry, which could lose domination of the transportation energy market, and the automotive industry, which would need to overhaul its hierarchical supplier structure and its service and marketing activities. One innovative response by these companies is the financing of astroturf groups—"grassroots" groups without roots. The debate reflects wide differences in political philosophy, economic interests, and environmental goals.

When three distinguished researchers from Carnegie Mellon University released a study last spring, claiming that "a 1998 model electric car is estimated to release 60 times more lead per kilometer of use relative to a comparable car burning leaded gasoline" and therefore that electric vehicles "don't deliver the promised environmental benefits," major newspapers and television news shows across the country made it a lead story. The study was first published as a two-page "Policy Forum" article in *Science* magazine in May 1995, and more recently was abridged as a Point of View article in the November–December 1995 issue of *TR News*.

Since its release, the study has been roundly criticized. As reported by the editors of *Science*, "An unusual number of letters were received ....'Amazing,' 'absurd,' and 'the analysis...does not appropriately support its conclusions' were some of the comments."

In their more recent article in *TR News*, the authors softened their tone, acknowledging that a great deal of uncertainty remains. But they did not alter their conclusions, defending themselves with the argument that "focusing on current data instead of speculating about the future makes these uncertainties manageable."

Although testing empirical data is, as the Carnegie Mellon researchers imply, at the heart of scientific inquiry, such analysis can be misleading when applied to rapidly evolving technology and emission control practices. To estimate future lead emissions from electric vehicles, the Carnegie Mellon researchers used 49 years of historical data from lead smelters, ignoring the fact that such emissions were not even controlled for 20 of those years. Emissions from modern primary smelters are 50 times lower than the averaged number used in the Carnegie Mellon research, and from secondary smelters, as much as 1,000 times lower.

On the vehicle side, the research team used two technology scenarios: an "available-technology" electric vehicle that was actually a 15-year-old test vehicle; and a "future technology" electric vehicle that resembled a 6-year-old production prototype from General Motors that goes on sale this fall as the EV-1. A true advanced-technology electric vehicle was missing from the analysis.

The cumulative effect of the many conservative Carnegie Mellon assumptions was to greatly overstate total lead emissions—by a factor of 1,000, according to the California Air Resources Board. But even if lead emissions were to increase, the effects on human health would be minimal. The issue is not how much lead is mined and emitted but the extent to which humans are exposed to it. In this case, most of the supposed emissions are in the form of solid waste, located far from populations and often more inert than the unmined lead itself. Consider that total U.S. lead use has increased from 4.48 kilograms per capita in 1960 to 5.28 kilograms in 1990. Yet lead concentrations in blood have dropped almost 90 percent. The reason is that most 1960 lead emissions were from tailpipes, resulting in high levels of human exposure, whereas 1990 emissions were mostly in solid inert form, as would be the case with lead batteries. Certainly less lead production is better than more, but the seriousness of this threat has been greatly overstated.

continued on page 56

[1] Electric-drive refers to vehicles powered by electric motors, with the electricity provided by batteries, on-board internal combustion engines, fuel cells, or some combination.

Daniel Sperling is professor of civil and environmental engineering and environmental studies and director of the Institute of Transportation Studies, University of California, Davis. He is the founding chairman of the Transportation Research Board Committee on Alternative Transportation Fuels.

Point of View *continued from page 21*

In any case, the number of lead-acid batteries used in electric vehicles will never approach the 72 million per year placed in today's gasoline vehicles. Lead-acid batteries are widely acknowledged to be nothing more than a short-term bridge to more advanced batteries and advanced nonbattery electric vehicles (such as hybrid and fuel-cell vehicles).

The Carnegie Mellon researchers concluded that "...automobile makers are spending hundreds of millions of dollars on near-term battery technology that is bad for the environment. Instead, resources could be devoted to developing more attractive technologies that will not be available for some years." In fact, automobile makers are spending virtually nothing on near-term battery technology for electric vehicles; most investments in such research and development are being made by unaffiliated battery companies (with the exception of GM's Delco), and at a scale far smaller than the authors imply. Even if automobile makers were spending substantial funds on near-term lead acid batteries, the spin-off benefits for ignition batteries (and other applications) might easily justify the investments.

Most investments by automobile makers in battery research and development, although negligible, already are devoted to advanced batteries. They have paid for about one-fourth of the $160.2 million spent by the U.S. Advanced Battery Consortium since its founding in 1991. Most of the remaining funds came from the U.S. government and electric utility companies.

The central premise of the Carnegie Mellon research—that the analysis of the environmental effects of electric vehicles should be broadened "to consider the life-cycle consequences of producing and reprocessing lead-acid batteries"—is exactly right. However, either they were unaware of or chose not to factor in the findings of many thorough, objective studies on the environmental benefits of electric vehicles. Their findings are flawed and inappropriately narrow to support their broad policy prescriptions.

Metropolitan Highways *continued from page 39*

advances to vehicles and fuels have substantially reduced vehicle emissions in the past 20 years. Further emission reductions can be achieved from improvements such as preheated catalytic converters, engine power enrichment regulations, use of oxygenated or alternative fuels, and more effective vehicle inspection and maintenance programs. Market solutions also show promise. For example, imposing tolls varied by time of day (i.e., congestion pricing) and collected electronically could help control travel growth on expanded highway links.

In the long run, stronger measures such as pricing motor vehicle travel to more fully reflect the full social costs of highway travel and the introduction of areawide, time-of-day tolls, may be necessary to provide direct incentives for reducing or shifting travel demand in ways that use highway capacity more efficiently and with less damage to the environment. Radical advances in vehicle technology could produce cleaner transportation, substantially reducing the level of vehicle emissions. The feasibility of some of these approaches is untested. In the judgment of the committee, however, as long run alternatives to current policy, they offer better prospects for reconciling economic and environmental interests and making significant improvements in metropolitan air quality and energy conservation.