SPECIAL • REPORT •

LONG ISLAND LIGHTING COMPANY

GETTING A CHARGE. Serviceman plugs in his electric van for overnight recharge after a day's driving.

Electric Cars

It's 7:30 A.M. You down your last swallow of lukewarm coffee, grab your briefcase, and head for the garage. You open the garage door, unplug your car from the wall socket. . . . Wait a minute. *Unplug* your car?

Sure. It's 1985, and you've recently bought one of the first mass-produced electric cars. It's taking some getting used to, some reprogramming of your automotive expectations, but you keep reminding yourself of the money you're saving now that gasoline costs $5 a gallon.

For one thing, your little two-passenger electric set you back some $10,000, about what a larger and more comfortable gas-powered car would have cost. And for longer trips and more room, you still need another larger, gas-burning car, because the electric one has to be recharged—for at least five hours—after every 50 miles of driving at highway speeds. The electric is also painfully slow; it takes almost 20 seconds to go from zero to 50 miles per hour, and cruising at its top speed of 55 mph drains the batteries so fast that you have to recharge them at work just to get home.

So you try to keep your speed below 50, which is difficult in fast-moving, gas-powered traffic, in order to avoid the $5 recharge fee in the office parking lot. You also save power by not playing the radio and by using the ventilation fan as little as possible, even though it's hot and stuffy in the little car. The vehicle doesn't have airconditioning or any of the power accessories you'd gotten so accustomed to in conventional cars.

This is one idea of what it might be like to own and drive one of the typical electric commuter cars that are likely to become available in the United States by the mid-1980's. No gas lines, no tailpipe pollution, minimal operating costs (until the batteries wear out), and easy maintenance are key advantages of these vehicles. But they will not be inexpensive to buy, and certainly not very convenient or enjoyable to operate. General Motors has decided that the electric vehicle (EV) market could be 200,000 to 300,000 units by late in the decade, and it plans to have one model available as early as 1984. Other major American automakers should be in the ball game as well, along with a sprinkling of smaller firms.

For several years, the U.S. Department of Energy (DOE) has been giving financial support to EV design and development, and it is encouraging utilities and other service fleet operators to purchase prototype cars or vans, operate them on a daily basis, and keep detailed records of the results. Companies that use electric cars in this demonstration program are entitled to tax credits, and the vehicle manufacturers also receive financial assistance through federal loan guarantees. The Environmental Protection Agency may count electric cars' energy efficiency as possibly equivalent to 185 miles per gallon for conventional cars—a powerful encouragement for automakers to rush them to market. Since the EPA's corporate average fuel economy (CAFE) requirement is set at 27.5 miles per gallon for 1985, and could possibly be much higher by 1990, such a high equivalency factor would allow automakers building EV's to keep some fairly larger conventional cars in their lineups for those customers who need or want them.

Although the advantages of converting much of the U.S. highway fleet to electric power are obvious—less automotive pollution and gasoline consumption—the means to that end, EV's that are practical, affordable, and desirable substitutes for gasoline- and diesel-powered automobiles, have long been elusive. Experimental EV's were built as early as the 1830's, and the rechargeable lead-acid storage battery that made them viable was invented in 1859. This battery was refined in the 1880's, and by 1900 electric cars were more practical than either the gas buggies or the steamers they competed with. The electrics were heavy, slow, expensive, and limited to short trips, and they required hours to recharge—but in those days, who cared?

It was around this time that electrical genius Thomas Alva Edison set out to develop smaller, lighter, and more powerful batteries—but couldn't. As a result, EV's reached their peak of popularity during 1912, then began to fade, becoming es-

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sentially a dead issue 12 years later. But interest in them has never died, reviving several times—during the fuel-short war years, at the beginning of environmental consciousness in the 1960's, in the wake of the 1973–1974 fuel crisis, and again with the significant increases in oil prices and spot gasoline shortages of 1979. This time, it seems the fuel worries are here to stay, and the EV will most likely get its long-awaited resurrection.

Enormous progress has recently been made in EV motor and control technology, in regenerative braking (which turns the motor into a generator during deceleration, to put some power back into the batteries), and in the vehicles themselves. But the really practical EV still awaits that major invention that Edison failed to develop 80 years ago: the truly compact, lightweight, powerful, and long-lasting storage battery. There have been some promising recent advances, although there is no method yet known for storing as much energy in a battery as a vehicle using gasoline can tuck away in a few gallons of liquid fuel.

Having spent millions of dollars on battery research over the past 15 years, General Motors announced what it termed a major breakthrough in September 1979—an advanced zinc–nickel oxide battery that, pound for pound, has more than twice the energy-storage capacity of the lead-acid type. But when installed in a converted subcompact Chevette, it was good for only a 50 mph top speed, a distance of 100 miles, and a lifetime of only 150 charge/discharge cycles, or about 30 weeks of five-day-a-week commuting. By the time the first GM electric car is introduced, the company hopes to have the new battery improved to a useful lifetime of 30,000 miles. "We've cleared a major technological obstacle," said GM President E. M. Estes when the battery was unveiled last year, but "we still have a tremendous amount of development work to do." GM researchers are also continuing work on advanced lead-acid batteries and other concepts as well, just in case.

In June 1980, Gulf & Western Industries unveiled a zinc-chloride battery with four times the power of a lead-acid battery of equal weight. G & W's zinc-chloride "electric engine," road tested for reporters in a Volkswagen Rabbit and two Japanese-made vans, was said to have a driving range of 150 miles at 55 mph. Moreover, the system's 4,002 graphite plates were termed virtually immune to wear, extending the battery's useful life to perhaps well over 1,000 recharges. Gulf & Western, which had already spent some $16 million on research and development, said it hoped to produce significant numbers of these batteries—either for sale to established automakers or for use in cars it would build itself—by the mid-1980's.

Although the big U.S. automakers also don't expect to have EV's available for sale to the American public until that time, three of them are already manufacturing small quantities for commercial use and evaluation under the DOE demonstration program. As of mid-1980, GM's Truck and Coach Division had delivered 20 of a planned 35 converted vans to Pacific Telephone and Telegraph in Culver City, Calif.; American Motors had produced about 360 Jeep-based "Electrotrucks" for the U.S. Postal Service and AT & T; and Volkswagen of America had supplied ten electric minibuses to the Tennessee Valley Authority. Other participants in the program, which the DOE hopes will put up to 10,000 new electrics into service by the mid-1980's, include Consolidated Edison and Long Island Lighting in New York and Walt Disney World in Florida, all of which have purchased vehicles from smaller manufacturers.

The newsletter *Electric Vehicle News* reported this year that about 23 firms already in the EV business expected to produce some 3,000 passenger cars in 1980, up from 700 in 1979, and 2,400 light trucks and vans, compared with about 1,000 last year. In addition, perhaps 800 home-built cars would be assembled by hobbyists during 1980, according to the newsletter. With interest in electric cars increasing every time the price of pump fuel goes up, it can be safely assumed that future years will see still more EV's going into at least limited service.

Of the primitive passenger electrics available right now, the least expensive is the tiny, two-seat, $5,000 Commuta-Car from Commuter Vehicles, Inc., of Sebring, Fla. This little doorstop-shaped runabout (like its slightly longer stablemate, Commuta-Van) is an early-1970's design and is little more than an enclosed, road-going golf cart, with a useful range of 35–40 miles and a maximum speed of 40 mph.

For the hobbyist interested in building an electric car, a variety of plans and kits are available, most of which list sources for the purchase of motors, controllers, and other necessary parts. One of these kit vehicles, a Bradley Automotive sports car, boasts zero to 30 mph acceleration in eight seconds, a top speed of 75 mph, and a range of 70 to 100 miles.

A buyer's guide for prospective EV owners, *World Guide to Battery-Powered Road Transportation*, published by McGraw-Hill, contains specifications, photos, and purchasing information on EV's that are now available, many of them converted from conventional passenger cars. Of these, perhaps the best-known are the Renault Le Car–based Lectric Leopard, built by U.S. Electricar Corporation, and the Electra 007, built by Jet Industries of Austin, Texas, and based on a Chrysler Omni/Horizon.

A number of interesting prototypes (manufactured primarily by companies with a vested interest, such as battery or electric motor producers) have been built and demonstrated in recent years. But they remain just that—prototypes for evaluation and demonstration purposes only—and they are not available for purchase. The most advanced is the sleek ETV-1, jointly developed by General Electric Corporation and Chrysler Corporation under a DOE contract. This aerodynamic beauty seats four in reasonable comfort, cruises at 55 mph, and can squeeze 70 miles from a charge in stop-and-go city driving or 115 miles at a steady 35 mph.

One prototype that may well go into production is the Silver Volt luxury electric, built by Electric Auto Corporation of Troy, Mich., and based on a midsize General Motors station wagon. The Silver Volt has a small, gas-powered auxiliary engine under the hood to run power accessories and put some charge back into the batteries, has a heater for the battery pack (batteries don't like cold weather), and boasts a range of 80–100 miles at 70 mph. Intended as a status symbol rather than a curiosity, it could be in production by late 1981—at a price of perhaps $18,000. EAC hopes to be selling 20,000 of them a year by 1985.

Unless and until the range of electric storage batteries is substantially improved, EV's will be limited to short-trip commuter, shopping, or commercial applications in urban and suburban areas. Still, the outlook is bright. Given the fact that nine out of ten U.S. car trips are for 20 miles or less, according to Department of Transportation data, EV's may begin replacing conventional vehicles in sizable numbers by the late 1980's. Some studies have shown a possible petroleum savings of 2.5 million barrels a day—about 30 percent of projected U.S. oil imports, 14 percent of total expected U.S. oil consumption—in the year 2000 if total "electrification" of the U.S. transportation fleet is achieved by then, admittedly an ambitious goal.

EAC President Sir Jon Samuel says flatly, "You'll all be driving electric autos within this decade," but others aren't so sure. While it may cost less than $1 to recharge an electric car at today's electricity rates, GM's Estes cautions that if batteries must be replaced every 30,000 miles or so, that expense—$1,000 to $2,000—must be factored into the cost-of-ownership equation. He also points out that the potential petroleum savings of converting to electric vehicles depends on whether the electric power consumed to recharge batteries is generated by burning oil or by other means. Some EV advocates claim that even petroleum-generated electricity would be more efficient for transportation than petroleum pump fuels, in terms of total consumption per mile, but others dispute that claim. A study by Paul D. Agarwal of GM's Research Laboratories concludes: "In times of gasoline shortage an electric car, even with limited range, can provide convenient transportation for a majority of automobile trips. Although it does not save primary energy resources," the report adds, "the electric car can transfer some of our transportation fuel needs from petroleum to coal, nuclear or hydropower."

Presumably, the decade of the 1980's will provide answers to some of the questions on the extent of electric cars' potential, as well as solutions to some of the EV's problems and shortcomings. GARY WITZENBURG