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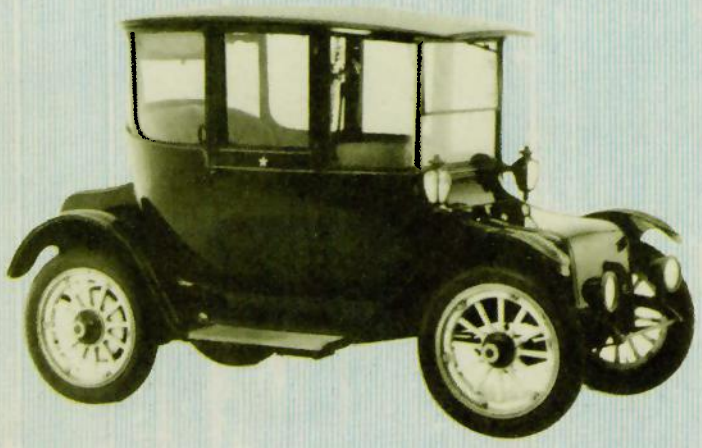
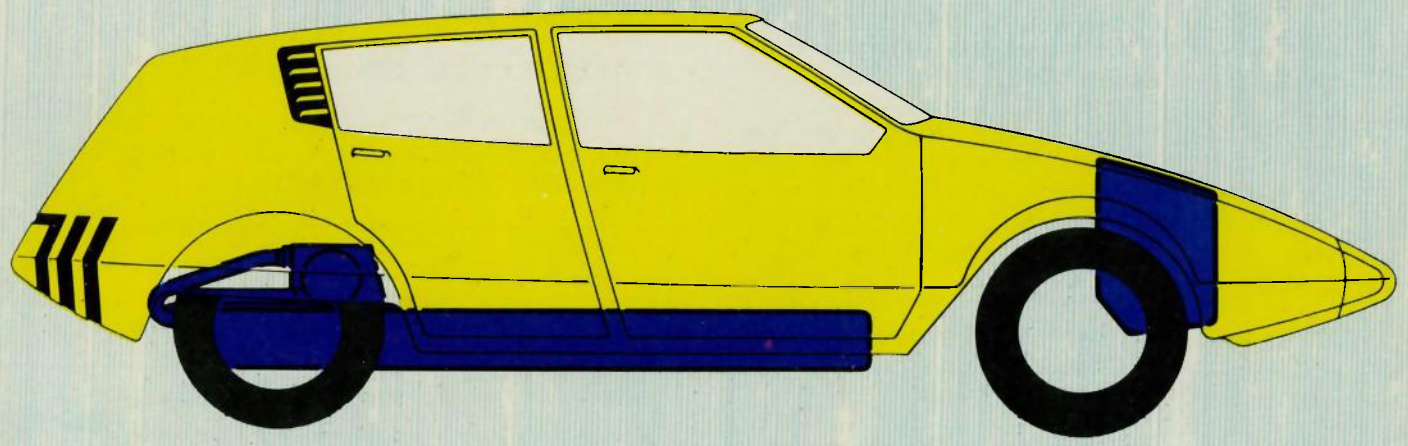
September, 1980



Electric cars are coming



- Cleaning up after Mount St. Helens
- Final House call for Tim Lee Carter

Gulf & Western Industries

General Motors and Gulf & Western saw breakthroughs in the past year

by Paul Wesslund

It's 5:30 p.m. on a Friday in the year 2000. Your electric car glides quietly into the parking space at your home. Before getting out, you tap a few buttons on the dashboard calculator and find the car's normal 200-mile range is down to 150 miles and that about three hours of recharging will bring the batteries up to full strength.

Punching a few more buttons, you discover that if you wait a few hours to plug in, you can save some money by taking advantage of the lower, nighttime, off-peak electrical rates. Tomorrow, you're leaving for a vacation up north — a lot farther than 200 miles away. So you go inside and start hunting for that certificate they gave you when you bought the electric — the certificate that allows you a month's free rent on one of those long-range, gasoline-powered automobiles.

That's not dreaming, but some of the more conservative projections by people who are looking closely at the future of electrically powered vehicles.

Electric cars have been gaining credibility during the last several months as General Motors announced it plans to begin mass production in 1985 or sooner, and Gulf & Western Industries, an international conglomerate, ballyhooed a breakthrough in battery technology it says could put 34 million electric vehicles on the road by the year 2000, cutting current gasoline consumption by 9%.

With those kinds of claims by private industry, "people have stopped looking at me like I'm talking through my hat," says Jerry Mader, who for the past year has been project manager for electric transportation at the utility industry's Electric Power Research Institute in Palo Alto, Calif.

Mader thinks the G&W predictions are overly optimistic, but he agrees that in the next several years there will be enough electric cars around to make a difference. EPRI is preparing a study to find out how utilities will be affected by the appearance of millions of electric cars.

3,000 and climbing

There are about 3,000 electric cars on the road today, many produced by small manufacturers. Their traveling range is around 50 miles, and cold weather and hills can be major obstacles. A car with reasonable range at 55 mph can cost $10,000 or more.

But G&W's improved battery, the corporation claims, could help produce a car with a range of 200 miles at a cost of $6,500. In January, G&W plans to begin producing one of those cars a day at a pilot plant in Greensboro, N.C. The cost of operating that car, says G&W, would be equivalent to driving a gasoline-powered car for about 46 cents a gallon.

General Motors says it will take a look at G&W's battery, but GM has confidence in its own research department improving its battery, which now has a range of 100 miles at 50 mph. GM estimates that, when it goes into mass production, its car will cost $2,000-$3,000 more than a comparable internal combustion vehicle; will operate for about half as much per mile as a gasoline-powered car; will completely recharge in 10 to 12 hours; and, could make up as much as 10% of the auto giant's total production.

Mader is wary of making predictions about electric cars, but depending on research advances and changes in the volatile price of gasoline, he guesses that by the year 2000 there could be between eight million and 25 million electric cars on the road — 4% to 12% of the U.S. vehicle fleet then. That many cars would

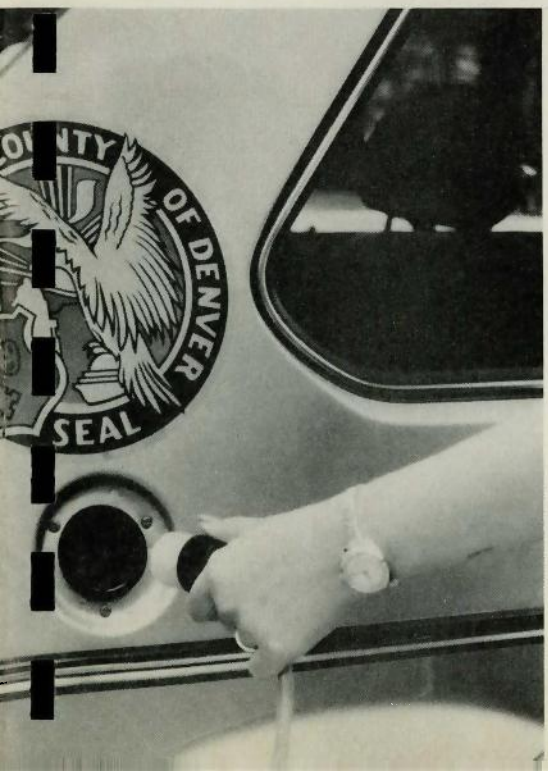
Please turn to page 11

Flect

(Right) The zinc-nickel oxide battery pack is installed in the rear of the General Motors experimental car, the Electrovette. (Below) The Traditional gas cap now covers an electrical connection where the car is plugged in for recharging at night.

...ic cars are coming

General Motors



New batteries promising more miles bring the new era a little closer

by Gary Luhr

New battery systems promising greater speeds and longer distances have sparked the latest interest in electric cars.

General Motors made headlines last September by announcing that its zinc-nickel oxide batteries could store twice the energy of conventional lead-acid batteries, while weighing only half as much. With this development, the company claimed to have broken the "vehicle battery barrier" that had long stymied engineers looking for ways to build an electric vehicle for everyday family use.

In June, Gulf & Western went the giant automaker one better by unveiling a zinc-chloride battery that would power a car G&W claimed, even farther than the GM battery.

The debate is now going on as to the relative merits of these batteries and others still being developed. Scientists and engineers at places like the U.S. Department of Energy's National Battery Test Laboratory are trying to go beyond the corporate superlatives to determine which battery is best, or, more precisely, which one is best suited for mass production.

Regardless of which battery comes out the winner — there is a good chance that different markets will emerge for each — a new era for electric vehicles seems closer at hand.

Several years in the works

But the "new" era isn't really that new. Ten years of research preceded GM's "breakthrough," and G&W's research team labored eight years before realizing what the company called a "singular achievement for our nation." *Electric Vehicle News*, the industry's quarterly publication, has been around for nearly a decade. And last May, the *third* International Electric Vehicle Exposition and Conference was held in St. Louis.

Development of EVs — a term that is broader and more common than "electric car" — isn't exclusively American. According to the Electric Power Research Institute (EPRI), "Great Britain, where driving distances are shorter and where gasoline traditionally costs at least twice as much as it does in the United States, is the historical leader in vehicle electrification."

More than 40,000 electric vehicles are used in England to deliver mail, milk and other commodities. West Germany, France, Italy and Japan also have active research and development programs.

In 1976, Congress spurred research and development in this country by appropriating $160 million over five years to the Department of Energy (DOE). The money is to help finance research demonstration programs to acquaint the public with electric vehicles and to show that they can work. Money also is available for loans to potential manufacturers.

Most of the EVs on American roads are part of experimental programs. The largest fleet — 350 — is used by the U.S. Postal Service, mostly in California to combat air pollution.

The Ohio Department of Transportation (ODOT) has been experimenting since August 1977, with two AMC Pacers, each one refitted with 20, six-volt lead-acid batteries, a 12-volt battery to operate accessories and a silicone rectifier to control speeds.

"The cars can top 55 mph," said Tom Foody, an ODOT research engineer, "but nobody drives them that fast because the high rate of discharge overtaxes the battery and cuts the travel range."

A new experience

Foody described what it is like to ride in one of the cars to Marcus Orr of Ohio's

Electric elegance revisited

by Marcus Orr

During the first two decades of the 20th Century, the electric car was far more prevalent than its gasoline-powered cousin. It was quiet, it was reliable and it didn't scare horses.

It was the darling of elegant "ladies of means" who glided silently on little morning spins in the park, to teas, the theatres and the shops.

"Drawing rooms on wheels" some folks called them, because of their lavish nickel and brass trim, fringed curtains and cut glass vases holding a single flower. And there was no mechanical hassle — just a speed controller and a tiller. But you couldn't go much farther than 20 miles on a charge, weight loads were limited, and going uphill was a task.

The "macho-man" of that era shunned the electrics. He much preferred the shake and smoke, the backfire and belch of opened muffler cutouts and the superior performance of the gas buggies.

The first electric vehicle was built by Fred Kimball in Boston in 1888. In 1898, Baker Electrics — "the aristocrats of motordom" — began rolling from a factory in Cleveland. They would cruise up to 40 miles at about 20 mph. Total registrations in 1900 found some 4,000 cars on the road, of which 38 percent were electric, 40 percent steam, and only 22 percent gasoline.

By 1908, however, Ford's Model "T" was in production and John D. Rockefeller was opening new oil wells. Then, in 1911, Charles Kettering of Dayton brought out the electric self-starter.

That did it. Even "little old ladies" who shunned the crank were won over. The gas engine, with its superior range, cost and convenience had beaten the electrics. By 1915, only 5,000 vehicles out of a million were electric. Ten years later almost none were being built, except for the Detroit Electric which could be special-ordered as late as 1939.

Mr. Orr is Managing Editor of Country Living, *the official publication of Ohio Rural Electric Cooperatives, Inc.*

Country Living magazine.

"The first impression a new driver gets is the starkness of the instrument panel — just two voltmeters and an ammeter. Turn on the ignition and everything's still dead silent. A push on the accelerator gets the car and its ponderous load of batteries (1,300 pounds under the hood and in the trunk) off to a sluggish start, accompanied by an annoying whine. Ride and handling are good, but the silence at street corners is a little unnerving. What if frisky youngsters or near-blind people fail to hear you?"

Poor acceleration and sluggish performance in hilly terrain and cold weather are frequently mentioned drawbacks to electric vehicles. A report by DOE's laboratory also listed several potential health and safety problems, including electric shock to passengers during an accident, and toxic gas which might be produced during battery recharging. These were not considered serious, however, and could be lessened, the report said, through design changes and driver education.

Greater drawbacks seem to be the limited speed and distances at which the vehicles are capable of traveling. While EVs can travel at 60 to 80 mph, driving them at such speeds (as well as in cold weather, over rough terrain, or in stop-and-go situations) greatly reduces the distance they can go between rechargings, which can take up to 16 hours.

"Americans don't like to wait, which is a major reason why they prefer private cars to public transportation," wrote Mary Wayne, in the *EPRI Journal*. "Enduring long recharging layovers would be even worse than standing at a bus stop or sitting in a gasoline line."

These problems are not necessarily insurmountable, however. If further battery improvements don't expand their range enough to make electric vehicles attractive to the general public, other possibilities exist. Among these are electrified highways, which would enable a driver to recharge his vehicle while traveling; a giant network of public recharging outlets; a system of battery exchange, and greater emphasis on hybrid vehicles which run partly on electricity and partly on other fuels.

Good marketing essential

The key to public acceptance may lie in how electric vehicles are marketed. An electric car may not take you camping at the lake, but it may be quite capable of taking you to church or to the grocery. The U.S. Department of Transportation estimates that 90% of the time he is driving, the average motorist travels 20 miles or less.

"People tend to buy cars now based on maximum perceived use — a long vacation, for example, — rather than for everyday travel," said DOE's Anthony H. Ewing. "Most conventional autos are overqualified for a high percentage of

their trips, since they are designed to perform a wide range of missions and are not fuel-efficient at very low speeds.

"The electric automobile is ideally suited for the commuter automobile, second car market," said Ewing.

The people at Gulf & Western, meanwhile, believe that, since most automobile travel falls in the "short distance" category, the electric car stands a good chance of one day becoming the "first" or "primary" car for the American family.

The biggest hurdle facing those who wish to expand the electric car market may be the cost. Even with mass production, an electric car is likely to cost more than a comparable gasoline powered vehicle, largely due to the cost of the batteries, according to EPRI.

To gain public acceptance, then, electric cars must be cheaper to operate and maintain. Electricity is already cheaper than gasoline as a vehicle fuel and likely to remain so. The gap, in fact, may grow larger. Routine maintenance is expected to cost less because electric vehicles have fewer parts to break down or need replacing. They don't have a starter, spark plugs, distributor, fuel pump, carburetor, pistons, valves, water pump, radiator, muffler, oil filter or pollution control device.

Battery cost uncertain

The biggest single expense after the initial purchase will probably be replacing the battery system. These now range from $800 to $1600 depending on the size of the vehicle and the number of batteries involved. "Present EV batteries can last from 18 months to three years, depending on how they are maintained," Ewing said. "We are hoping that research and development will increase battery life."

There is also the cost of the recharger, which varies with the type of battery involved, but is likely to run several hundred dollars.

Meanwhile, private industry is pushing ahead with electric cars with the government's blessing — and with good reason. Transportation in the United States consumes about 8 million barrels of oil every day. According to EPRI, if only one-fourth of the miles driven in conventional vehicles were driven in electrics instead, it would save about 2 million barrels a day, more than 700 million barrels a year.

"In the long run," says EPRI, "with more specialization of vehicles for different transportation modes, a much higher level of substitution appears possible . . . if all the vehicles that could run on batteries rather than liquid fuels — city buses, light trucks, light vans and passenger cars used for short-distance driving — were actually to convert, about 70% of the oil used in the transportation sector might eventually be replaced by electricity."

Clearly, it would appear that electrified transportation, if not around the corner, is somewhere down the road.

General Motors

The breakthrough in batteries is seen in this size comparison. The General Motors zinc-nickel oxide batteries in the rear contain as much energy as the conventional lead acid batteries in the foreground but weigh less than half as much.

Breakthroughs

Continued from page 8

use between 40 billion and 200 billion kilowatt-hours of electricity per year, as much as could be produced by 6 to 28 nuclear power plants.

But, rather than building that many more plants, the electric industry hopes the cars could add to utility income without requiring more power plants, by plugging in during times of low power use.

Electric costs could drop

"By 1990, we're going to have a whale of a lot of electric automobiles in this country," says National Rural Electric Cooperative Association Executive Vice President Robert Partridge, "and if they can plug in mostly at night during off-peak periods, it's going to help dramatically in cutting the average unit cost of electric power."

"Utilities have a lot to gain from electric transportation," says EPRI's Mader. "The annual growth rates for power use have sort of topped out, and they're going to have to start looking at how they're going to fill those valleys of low use. They're going to need this type of load and at the same time they can fulfill the national goal of becoming less dependent on petroleum."

By fall, EPRI hopes to have chosen an area where it will work with a utility to encourage the use of several electric cars, so the effects on the utility can be studied.

"We're not just talking about a new kind of car, the whole transportation system is going to change," says Mader. "Utilities need to sit down and work with General Motors, with the federal government and the battery manufacturers. We're going to need a standard system or the whole package isn't going to fit together."

Meanwhile, the Energy Department has proposed a formula to encourage car manufacturers to build electric cars. The formula would express electricity use by cars in terms of miles per gallon, to help car manufacturers comply with the Environmental Protection Agency regulation requiring a "corporate average fuel economy" standard of 27.5 mpg by 1985.

Electric cars are not now included in that rule, but the administration hopes that, by giving them a high mpg rating, car manufacturers will have more of an incentive to produce electric cars. The formula would rate current electric cars at about 125 mpg, and could rate more advanced models that might be produced in the mid-1980s, at about 185 mpg. The proposal is expected to be in effect, for a seven-year evaluation, by fall.

Mr. Wesslund is the National Rural Electric Cooperative Association's Washington correspondent.