





**GENERAL MOTORS  
EV1 ELECTRIC VEHICLE**

**EV1- General Motors Electric Vehicle**

**Product Information**

**1996**



GENERAL MOTORS CORPORATION

General Motors Building, Detroit, Michigan 48202

NEWS

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LOS ANGELES -- General Motors will be the first major automaker in modern times to market specifically designed electric vehicles to the public when its new EV1 passenger car goes on sale later this year, GM Chairman John F. Smith, Jr. said today.

"It's time to get electric vehicles out of the lab, into the showroom and onto the road," Mr. Smith said in making the announcement.

The two-seat EV1 -- first vehicle in the company's history to carry a General Motors designation -- will be marketed this fall by Saturn retailers in four western markets: Los Angeles, San Diego, Phoenix and Tucson. "While the EV1's market initially may be limited in scope, we are expansive in what we believe this car says about the kind of company GM is going to be," Mr. Smith said.

Saturn's dedication to customer care and the total ownership experience made it the right team to market the car, Mr. Smith said.

Pointing to the EV1 as a symbol of GM's commitment to technological and environmental leadership, Mr. Smith described the car as "the first product in a portfolio of high-technology products that we will be bringing to market in the years ahead."

"These products will define the GM of the future," he added.

Mr. Smith said the EV1 is equipped with dual airbags, anti-lock brakes, a CD player and cruise control. "Most important, it's a car designed for people -- to commute, to shop, to run around town. And it's a car for people who never want to go to the gas station again," he said.

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Mr. Smith said GM tests showed consumers were overwhelmingly impressed with the car. "It's quiet, peppy and fun to drive," he said. It is the world's most aerodynamic production vehicle and it carries 23 new patents in a variety of new technologies, he said.

"When auto industry historians look back, they will see this car as the first in the new generation of vehicles," Mr. Smith said. "And they will note that GM made it."

In referring to the GM badge carried by the car, Mr. Smith said EV1 represents the design, engineering and manufacturing work of many partnerships within the company. "We have the resources no one else can match," he said. "And they were all brought to bear in developing this car. Delphi Automotive Systems, Delco Electronics and our North American Operations all contributed their technology and creativity in bringing the car to the consumer."

Mr. Smith said GM will also market an electric pick-up truck nationwide in 1997 for use in commercial fleets. The truck -- the Chevrolet S-10 -- will be built in Shreveport, La. and will use the same technologies as the EV1. "These pick-ups will be especially appropriate for predetermined routes where the truck comes back to the garage every night," Mr. Smith said.

Robert C. Purcell, executive director of GM Electric Vehicles, said his main objective was to "make a business" of electric vehicle technology. "And in this business, it all comes down to the hardware," he said.

He called the EV1 "the world's most energy-efficient vehicle platform. If you look at virtually every system in this vehicle, there are innovations in design, processing and materials that create an entirely new class of automotive transportation product focused on energy efficiency and environmental compatibility," he said.

Mr. Purcell said both the EV1 and the Chevrolet electric pick-up truck will use the Delco Electronics Magne-Charge inductive charging system. "We believe this system will set the standard for convenient, efficient and safe electric vehicle charging," he added.

The Magne-Charge System has already been tested and well received by over 500 consumers nationwide in GM's PrEView Drive electric vehicle test drive program.

Mr. Purcell said the EV1 will be built at GM's Lansing (Mich.) Craft Centre, an assembly operation that will "set a new benchmark for manufacturing efficiency in a low-volume build." He cited UAW Local 1618 for "an outstanding job in working with the EV platform to develop the processes and systems necessary to put this vehicle into production."

Donald W. Hudler, president of Saturn, noted the EV1 will be launched much the same way as the first Saturn models back in 1990, with the first introductions coming in southwestern states.

"Another reason we're launching in the southern California and Arizona markets is because they afford the topographical and climatic conditions found to be most favorable to electric vehicle operation," Mr. Hudler said.

He said Saturn retailers who will sell the EV1 are "truly excited about this new opportunity, not only for themselves but for what this vehicle's success can do for the image of Saturn as a 'different kind of company.'"

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## General Motors' EV1 Specifications

OVERALL LENGTH	-	169.7 in.	4309 mm
OVERALL WIDTH	-	69.5 in.	1766 mm
OVERALL HEIGHT	-	50.5 in.	1281 mm
WHEELBASE	-	98.9 in.	2512 mm
TRACK (Front)	-	57.9 in.	1470 mm
(Rear)	-	49.0 in.	1244 mm
CURB WEIGHT	-	2970 lbs	1350 kg
FRONTAL AREA	-	1.89 sq. m.	
DRAG COEFFICIENT	-	0.19	
TIRE SIZE	-	175/65R14	
RATED MOTOR POWER	-	137 hp	102 kW
RATED BATTERY CAPACITY	-	16.2 kW-hr	
- 26 Modules / 312 Volts			
- Battery Pack Mass	-	1175 lbs	533 kg
- Battery Module Mass	-	1078 lbs	489 kg
RECHARGE TIME (from 15% to 95% state of charge)			
- 220 volt / 6.6 kW	-	Approx. 3 hours	
- 110 volt / 1.2 kW	-	Approx. 15 hours	
RANGE (85% depth of discharge)			
- EPA City Schedule	-	70 miles	
- EPA Highway Schedule	-	90 miles	
0-60 MPH ACCELERATION	-	under 9 seconds (when fully charged)	
TOP SPEED	-	80 mph (electronically regulated)	

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## General Motors Electric Vehicle Historical Summary

- 1912-16      Production of 682 electric trucks by GM Truck Company. The model line-up included 3 frame lengths and 9 load ranges. Lead-acid and Edison (nickel-iron) batteries were offered.
- 1964      Electrovairster I, a Corvairster conversion, with pioneering 90-hp AC induction motor, silicon controlled rectifier (SCR) inverter and 450-volt silver-zinc battery pack.
- 1965      Electrovan, a GMC van conversion, with 32 hydrogen-liquid oxygen fuel cells as the electric propulsion system's energy source. A 125-hp AC induction motor drove the rear wheels through a gearbox.
- 1966      Electrovairster II, a Corvairster conversion, with 115-hp AC induction motor, SCR inverter and 530-volt silver-zinc battery pack.
- 1969      Two-seat urban vehicle concept: XP-512. Three vehicles demonstrated internal combustion (IC) engine, electric and hybrid propulsion systems. Electric vehicle used 8-hp DC motor to drive the rear wheels and had an 84 volt lead-acid battery pack. Top speed was 30 mph.
- 1969-72      The Lunar Rover vehicles were built for the Apollo Program with Boeing as the prime contractor. These electric vehicles used a motor at each wheel, had four-wheel steering and used a non-rechargeable battery. Three of these vehicles are still on the moon; left behind by the Apollo 15, 16 and 17 astronauts.
- 1970      XEP, an Opel Kadett conversion, used 2 DC motors driving the rear axle and a hybrid zinc-air + lead-acid battery pack system to achieve a 90-mile range at 55 mph.
- 1977      The Electrovette, a Chevette conversion continuing in the tradition of the Electrovairsters, demonstrated nickel-zinc battery technology and launched a program to design and develop a production electric vehicle.
- 1979      Thirty-five G-vans were converted for two AT&T fleets. The DC motor produced 50-hp and 36 12-volt lead-acid batteries were used in the 216-volt pack. The range was 40 miles.
- 1980      Twelve Chevette conversions were built by the EV Project center to evaluate the nickel-zinc batteries and electric propulsion system. The 120-volt battery pack contained 72 cells and the DC motor was rated at 33-hp. The range was 60 miles on the EPA city schedule.



- 1980-82 Ground-up electric vehicle being designed by General Motors' Electric Vehicle Project Center. Program was terminated when the nickel-zinc battery was not able to meet the required specifications.
- 1985 Thirty-two Bedford Griffon vans were converted to electric propulsion. This completed nearly 10 years of design, development and prototype builds using the Bedford vans as the base vehicle.
- 1987 Sunraycer, a solar energy recharged electric vehicle, won the 1987 Solar Challenge in Australia by 2-1/2 days. The efficiency lessons learned established the direction for the Impact show car.
- 1986-89 Over 100 GMC G-van conversions were built by Magna for an Electric Power Research Institute Program. These vehicles utilized the experience with the earlier G-van and Bedford van programs to direct the design. Many of these vehicles are still in operations today.
- 1990 On January 3rd, the Impact electric vehicle was announced at the Los Angeles Auto Show. The response was phenomenal. This was the first generation vehicle and is presently on display at EPCOT in Orlando, Florida.
- 1990 On April 18, General Motors announced that it was forming a group that would be charged with developing a production version of the Impact show car.
- 1990-91 Several Geo Storms and Lumina APVs were converted to electric vehicles using Impact show car systems for test and development of propulsion and braking systems. One Storm EV was dedicated as an electric vehicle demonstrator to provide the first EV experience to many people.
- 1991 The HX-3, a hybrid-electric show car, was presented at the Detroit Auto Show in January. The electric propulsion system was based on that used in the Impact show car.
- 1991 Two Opel Astra wagons were converted to electric vehicles using the Impact show car propulsion technology. One was shown at the Frankfurt Auto Show in September, the Impuls.
- 1992 Built in just 99 days and driven on May 1, the "Fast Build" Impact demonstrated the GMEV-designed vehicle. It was the first POC (point-of-concept) vehicle that integrated all of the systems being designed and developed. This was the second-generation vehicle.
- 1992-93 Twelve additional POC Impacts were built and engineering test and development vehicles. One of these vehicles was dedicated to consumer marketing and communications projects. These were the third-generation vehicle design.

- 1993-94 Fifty PrEView Impacts were built at the GM Tech Center. These were the fourth-generation vehicle design and are being used in the PrEView Drive program for test and development.
- 1993-94 Eighteen Opel Astra wagons were converted to EVs, named Impuls II. Ten are involved in the German EV demonstration program on Ruegen Island.
- 1994 A specially-prepared Impact established new world records for electric vehicles at the Fort Stockton, Texas, test track on March 11. Among the records was a top speed of 183.822 mph.
- 1994-96 PrEView Drive Program launched in June 1994. Several hundred drivers use the vehicles for two-week periods in 11 cities. This is a cooperative program with 14 electric utilities and will conclude in December 1996.
- 1995 The production line was alive. In March, the Lansing Craft Centre began building the fifth-generation Impact vehicles just 365 days after the program was started. Thirty-four vehicles were built during the year -- refining the manufacturing processes and providing additional test and development vehicles.
- 1995 An electric S-Series pickup truck prototype was shown at the Electric Utilities Fleet Manager's Conference in Troy, Mich., in August. This vehicle is being used to determine potential fleet customer interest. The vehicle's propulsion system technology is based on that of the Impact.
- 1996 On January 4th and 5th, the EV1 was announced at the Los Angeles and Detroit Auto Shows. The vehicle will be available in the fall of the year. At the same shows, the S-Series electric pickup truck production was also announced, to begin in 1997 and marketed to the fleet customer segment.

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Remarks by

John F. Smith, Jr.  
Chairman of the Board  
Chief Executive Officer and President  
General Motors Corporation

at the

1996 North American International Auto Show  
Detroit, Michigan  
January 5, 1996

John F. Smith, Jr.  
Electric Vehicle Announcement  
January 5, Detroit

Good morning. As you already know, we announced yesterday in Los Angeles that this coming fall, General Motors will be the first major automaker in modern times to market specifically designed electric cars to the public.

We have the assembly plant tooled. We have the distribution system ready. We have the markets identified. And we have the automobile. The EV1 from General Motors ...

Let me introduce you to the driver. . .Maureen Midgley, who is the manager of the plant in Lansing, Michigan, where the EV1 is already in prototype production. The passenger next to Maureen is Tim Driver, president of UAW Local 1618 in Lansing.

This is not a concept car. This is not a conversion. This is a passenger car developed specifically as an electric vehicle.

- It is a car that meets all 1997 federal safety standards and is equipped with dual airbags and anti-lock brakes.
- It is a car that surpasses environmental standards with zero emissions.
- It is, most important of all, a car designed for people -- to commute, to shop, to run around town. It is a real car with power steering, power brakes, power windows, a CD player and cruise control.
- It is a car for people who never want to go to the gas station again.

Our tests show that people are overwhelmingly impressed with the car -- it's quiet, peppy, fun to drive. In all honesty, it's probably not a car for everyone, but then neither is the Corvette or the Suburban. We do see an emerging market, however, that we intend to fill.

To start, it will be sold in four select Western locations--Los Angeles, San Diego, Phoenix and Tucson. While the EV1's market initially may be limited in scope, we are expansive in what we believe this car says about the kind of company GM is going to be in the future.

So let me tell you, strategically, what the EV1 means to GM as a corporation.

When I first became CEO, those of us in leadership positions began putting into place policies to turn the company around. While not complete, those plans are proceeding. We've now begun to look at what kind of corporation GM needs to be in the years ahead.

Although work on this car began in 1990--before mandates I might add -- it is very tied to how we see ourselves in the future, especially our commitment to technological leadership and our commitment to environmental stewardship.

As you may know, GM has a lot of firsts to its credit:

- the first electric starter
- the first V-8 engine
- the first automatic transmission
- the first airbag
- the first catalytic converter

The list is quite long and technically impressive. In the 1970s and '80s, GM's technological talents were overshadowed by our Japanese competition, which offered higher quality cars that better met the needs of many Americans.

Part of our vision is to recapture our leadership in the public's mind as an innovative technology company. This EV1 vehicle is important not just because it's the first car built from the ground-up as an electric car. It is even more important as the first product in a portfolio of high technology products that we will be bringing to market in the years ahead. These are products that will define the GM of the future -- products that also will help us to understand more about technology and its application. This is a phase of knowledge for us -- and for the industry... a phase that will lead us toward other advanced technologies.

The EV1 is the world's most advanced vehicle platform. It is the world's most energy efficient vehicle. It is the world's most aerodynamic production vehicle. The car carries 23 new patents in a variety of critical new technologies. When auto industry historians look back, they will see this car as the first in the new generation of vehicles. And they will note that GM made it.

It is time to get electric vehicles out of the lab, into the showroom and onto the road. The electric car, like any other technology or product, needs to face the discipline of production and marketing. It needs to feel the cold pressure of the bottom line and the hot breath of the customer. It must learn to operate in the market place. This is what we are undertaking. GM's goal is to make a business out of electric cars.

You'll notice that the car's badge is GM. This is the first time in General Motors' history that one of our cars has carried the GM brand. The GM name reflects the design, engineering and manufacturing work of many partnerships within the company. In considering what kind of company GM is to be, we found one thing that distinguished us is the breadth of capabilities that no other auto manufacturer can offer. We have resources that no one else can match. They were brought to bear in developing this car. Delphi Automotive Systems, Delco Electronics, Hughes, and our North American Operations all contributed their technology and creativity in bringing this car to the consumer. This is truly a GM car.

Saturn, as its contribution, will market the vehicle. We believe the great confidence that the public has in Saturn's care for the customer will reassure EV1 buyers.

We hope we are on the threshold of building, not just a single, special-purpose electric car, but an electric vehicle industry.

Starting in 1997, we will also sell an electric truck nationwide to commercial purchasers for their fleets. This vehicle will be designed and marketed by General Motors and will be built in Shreveport, Louisiana. It will use many of the same technologies as the EV1 but will be packaged into Chevrolet S-10 pick-up. These pick-ups will be especially appropriate for predetermined routes where the truck comes back to the garage every night.

Our vision is innovative in outlook, and it is global.

John Smale, who just stepped down as GM's chairman, took an around-the-world trip in October. He was part of a delegation that visited Havana, Moscow, Hanoi and Hong Kong. He said that the thing that struck him most in all those places was people's awareness and craving for state-of-the-art consumer goods, including automobiles.



Here's the fascinating and great challenge for us in the emerging economies. It is unrealistic to assume that the rest of the world will develop a transportation model like the United States -- with interstate highways and wide open spaces. The model for China or India, for example, is much more urban. Who knows? There are countries that may go directly to electric vehicles for their big cities.

There will be a real need for short distance, clean, energy-efficient vehicles. The company that can make that car will be a step ahead. A step ahead globally. A step ahead technologically. A step ahead strategically.

GM wants to be the first to take that step.

All this is the context in which we today announce the EV1.

Before we move on, I want to say a couple of words about the people who brought us this far. While I couldn't begin to acknowledge every single person, it is an incredible team effort... led by Ken Baker, who has been the "father" of the EV. Ken led the team that turned our vision into a real product. And secondly, Bob Purcell, our executive in charge of all GM electric vehicle operations, who is responsible for taking the car from the engineering phase to market. Bob used to be our director of strategic planning, so we've decided to move him from "thinker" to "doer" and give him a real job...

Let me turn it over now to Bob, who will give you more information about EV1 itself.