8. Conducting any other necessary activities relating to electric vehicles.

The Japan Electric Vehicle Association describes its formation and role as follows:

The research and development of electric vehicles in Japan had been conducted on a large scale as a big project of the Agency of Industrial Science and Technology of the Ministry of International Trade and Industry (MITI) for 6 years starting from 1971.

Although automobile traffic in Japan had rapidly grown since around 1960 as an indispensable transportation means rooted in the life of the people, the progress of environmental pollution due to automobiles, or traffic jam, exhaust gas, noise, etc. had become a serious social problem.

From the viewpoint of preventing the environmental pollution due to automobiles, the Agency of Industrial Science and Technology had employed a theme "R & D of electric vehicles: and carried out this R & D as a national-scale big project for a time period of 6 years and with a budget of approximately *5.7 billion yen* under tripartite cooperation among governmental, academic and private sectors. Developed as a result were than the world's highest-performance components such as a battery, motor and controller, and a variety of electric vehicles mounting those components. *Technology and know-how gained through this R & D paved the basis of the subsequent R & D of electric vehicles.*

In 1976, the last year of the big project, the Electric Vehicle Council was founded as an advisory body to MITI for the purpose of drafting measures that promote the popularization of electric vehicles. Also in this year, Japan Electric Vehicle Association was established for making electric vehicles more popular under MITI's guidance. Besides, in 1978, Electric Vehicle Engineering Research Association (EVERA) was set up for developing practical electric vehicles of standard type. This association conducted R & D while receiving MITI's subsidy. Still now, these three organizations are engaged in activities on the research, development and popularization of electric vehicles throughout this country including private companies under MITI's leadership."

4.4.2 Electric Vehicle Development Corporation (EVDC), U.S.A.

U.S. organizations supporting the commercialization of electric vehicles include:

Electric Vehicle Development Corporation (EVDC),California

Electric Power Research Institute (EPRI), Palo Alto, California

U.S. Department of Energy (DOE), Washington

Various electric utility companies

The background of the EVDC was described in a paper published at the Seventh International Electric Vehicle Symposium; November 13 to 16, 1988; in Toronto.

" Background

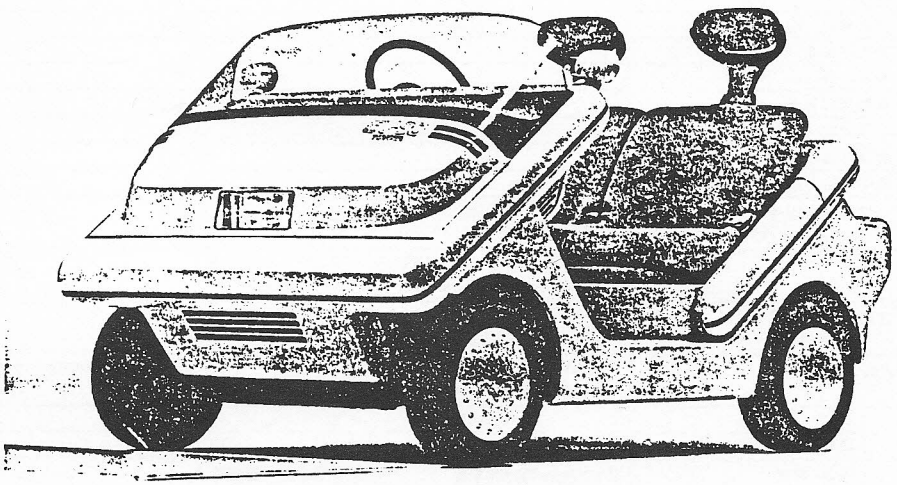
Electric vehicle commercialization requires the parallel development and evolution of technology, market, and infrastructure. Since the mid-1970s, significant effort and resources have been committed to EV technology research and development. Until 1984, however, little attention was directed to defining and building an initial market for EVs and establishing the support systems required to keep EVs operating and productive in the field.

Recognizing this, and the long-term potential for EVs, a group of electric utility companies formed the Electric Vehicle Development Corporation in 1984. *EVDC's sole purpose is to successfully commercialize EVs* in North America by consolidating the interest and activities of key stakeholders. EVDC is supported by its membership, which includes electric


For the Future...
the ELECTRIC AUTOMOBILE
TEXAS
EXAR-1
Anything else is obsolete...

のステージだ

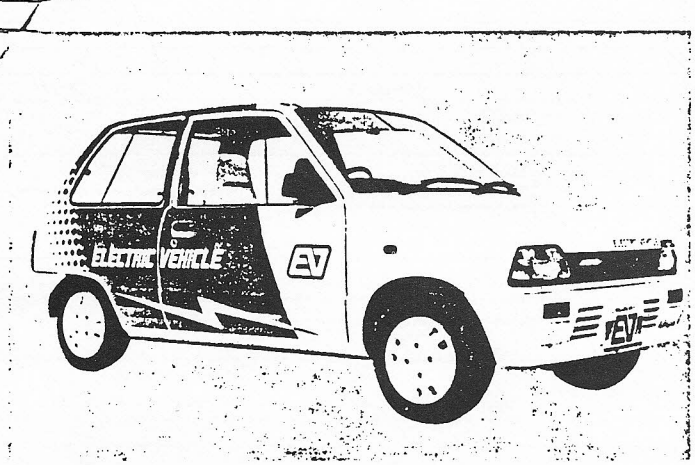
EV-30



■トヨタ自動車株式会社
TOYOTA MOTOR CORPORATION

新開発の亜鉛／臭素電池を搭載した二人乗の特定地域内移動用電気自動車です。新感覚のデザインと新たな用途が広がります。(研究実験車)

EV-30 is a two-seater electric vehicle with a new Zinc/Bromine battery, developed to transport people from room to room. This fationable concept makes it more enjoyable and versatile.

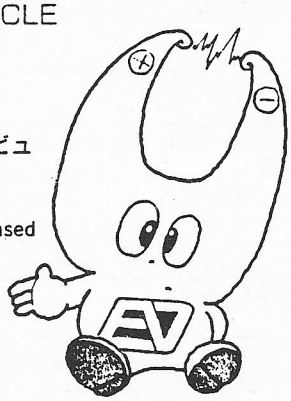


スズキアルト電気自動車
SUZUKI ALTO ELECTRIC VEHICLE

■鈴木自動車工業株式会社
SUZUKI MOTOR CO., LTD.

新型アルトをベースにした、パーソナルビューティ高性能電気自動車です。

High performance & personal beauty EV based on new ALTO.

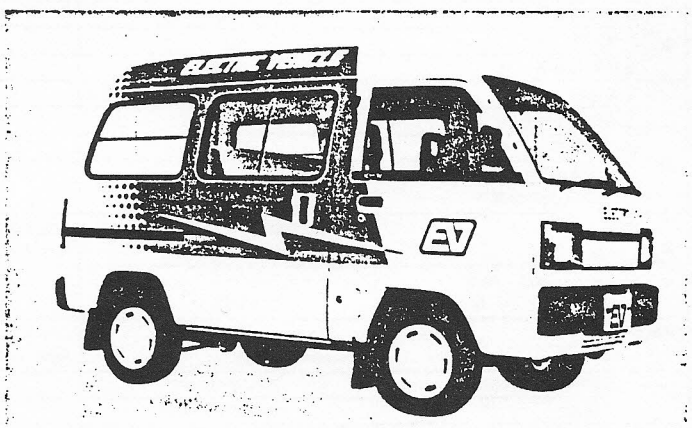


三菱ミニキャブバン電気自動車
MITSUBISHI MINI-CAB ELECTRIC VAN

■三菱自動車工業株式会社
MITSUBISHI MOTORS CORPORATION

4人でもゆうゆう乗れるので、街を走るサービスカー、業務連絡車として最適です。

Its roomy space for 4 passengers provides best suitability for service and business use in urban



スズキエブリイハイルーフ電気自動車
SUZUKI EVERY HIGH-ROOF ELECTRIC VEHICLE

■鈴木自動車工業株式会社
SUZUKI MOTOR CO., LTD.

新型エブリイハイルーフをベースにした濃密な、悠然たる大気の流れの電気自動車です。

Streamlined EV, based on new EVERY HIGH-ROOF, with an air of perfect composure.

電気自動車主要諸元表 SPECIFICATIONS FOR ELECTRIC VEHICLES

製造事業者名		日産自動車㈱ NISSAN MOTOR CO., LTD.	電気自動車技術研究組合 ELECTRIC VEHICLE ENGINEERING RESEARCH ASSOC.	電気自動車技術研究組合 ELECTRIC VEHICLE ENGINEERING RESEARCH ASSOC.	トヨタ自動車㈱ TOYOTA MOTOR CORPORATION
主要寸法	全長 m	3.785	3.990	4.200	2.100
	全幅 m	1.560	1.645	1.625	1.320
	全高 m	1.395	1.390	1.380	1.140
質量	空車質量 kg	1.070	1.200	1.210	470
	最大積載量 kg	−			
	乗車人員 人	2	4	4	2
	自動車総質量 kg	1.180	1.420	1.430	590
性能	最高速度 km/h	70	90	90	43
	登坂能力 tan θ	0.3	0.25以上	0.25	0.15
	最小旋回半径 m	4.4	4.7	4.8	2.7
	一充電走行距離 km (km/h定速走行時)	186 (40)	200	170	165 (30)
原動機	種類	交流マグネットディスク同期型電動機 AC permanent magnet disc motor	直流分巻電動機 D.C.shunt motor	直流分巻電動機 D.C.shunt motor	交流かご型誘導電動機 A.C.induction motor
	定格出力・電圧・時間 kW ・ V ・ h	15・130・1	12・90・1	12・90・1	4.1・60・1
制御方式		トランジスタインバータ・最適電流マップ制御方式 Transistor inverter current phase control	サイリスタチョッパ・トランジスタチョッパ併用制御方式 Thyristor and Transistor chopper	サイリスタチョッパ・トランジスタチョッパ併用制御方式 Thyristor and Transistor chopper	トランジスタインバータ制御方式 Transistor inverter
タイヤ	前輪	155SR12	175/70SR13	155SR13	135/60R10
	後輪	155SR12	175/70SR13	155SR13	135/60R10
電池	主電池 種類・形式	鉄・ニッケルアルカリ電池 Iron-Nickel	ニッケル・亜鉛電池 Nickel-Zinc	ニッケル・亜鉛電池 Nickel-Zinc	亜鉛・臭素電池 Zinc-Bromine
	主電池 容量・電圧 Ah/HR・V	160/5・7.2	200/5・13.2	200/5・9.9	80/5・10.6
	主電池 個数 個	18	8	10	1
	主電池 総電圧 V	130	105.6	99	10.6
	補助電池・形式・電圧 V	−	NS40ZAL・12	34B19L・12	PE10-2R・12
充電装置	設置形式	別置形 Stationary type	別置形 Stationary type	別置形 Stationary type	車載形 On vehicle type
	充電制御方式	準定電圧充電 Modified constant potential charge	定電流充電 Constant current charge	2段定電流充電 Two step constant current charge	定電流定電圧充電 Constant potential current regulated charge
	交流入力電源 相数・電圧・電流 φ ・ V ・ A	1・200・20	3・200・15	3・200・20	1・100・18
	標準充電時間 h	7	8	10	8

製造事業者名		ダイハツ工業㈱ DAIHATSU MOTOR CO., LTD.	㈱東京アールアンドデー TOKYO RESEARCH & DEVELOPMENT CO., LTD.	マツダ㈱ MAZDA MOTOR CORPORATION	ダイハツ工業㈱ DAIHATSU MOTOR CO., LTD.
主要寸法	全長 m	3.255	1.668	4.105	3.540
	全幅 m	1.160	600	1.640	1.500
	全高 m	1.870	975	2.200	1.950
質量	空車質量 kg	610	90	1.640	1.015
	最大積載量 kg	60			
	乗車人員 人	4	1	9	8
	自動車総質量 kg	890	145	2.135	1.455
性能	最高速度 km/h	20	60	80	15
	登坂能力 tan θ	0.29	0.25	0.32	0.3
	最小旋回半径 m	3.6	1.730	4.3	3.5
	一充電走行距離 km (km/h定速走行時)	1.5〜2ラウンド	70 (30)	80 (40km/h)　100 (20km/h)	60
原動機	種類	直流直巻電動機 D.C.series motor	希土類永久磁石ブラシレス直流電動機 Rare earth permanent magnet D.C brushless motor	直流分巻電動機 D.C.shunt motor	直流分巻電動機 D.C.shunt motor
	定格出力・電圧・時間 kW ・ V ・ h	5.5・45・1	0.6・48・連続	12・100・1	7・45・1
制御方式		トランジスタチョッパ制御方式 Transistor chopper	パルス幅変調方式 Pulse width modulation control	サイリスタチョッパ・トランジスタチョッパ併用制御方式 Thyristor and Transistor chopper	トランジスタチョッパ制御方式 Transistor chopper
タイヤ	前輪	19×800-10-4PR	3.00-10-2PR	165R14-6PRLT	5.00-10-6PR
	後輪	19×800-10-4PR	3.50-10-4PR	165R14-6PRLT	5.00-10-6PR
電池	主電池 種類・形式	鉛電池・EB145 Lead-acid	鉛電池・EB35 Lead-acid	鉛電池・ED150 Lead-acid	鉛電池・EB120 Lead-acid
	主電池 容量・電圧 Ah/HR・V	145/5・12	24・12	150/5・12	120/5・12
	主電池 個数 個	4	4	10	8
	主電池 総電圧 V	48	48	120	48(2並列)
	補助電池・形式・電圧 V	−	−	NS40SL・12	28B17L・12
充電装置	設置形式	車載形 On-vehicle type	別置形 Stationary type	別置形 Stationary type	車載形 On-vehicle type
	充電制御方式	準定電圧充電 Modified constant potential charge	準定電圧充電 Modified constant potential charge	準定電圧充電 Modified constant potential charge	準定電圧充電 Modified constant potential charge

本自動車工業㈱ UKI MOTOR CO., LTD.	三菱自動車工業㈱ MITSUBISHI MOTORS CORPORATION	鈴木自動車工業㈱ SUZUKI MOTOR CO., LTD.	日産自動車㈱ NISSAN MOTOR CO., LTD.	manufacturer	
3,195	3,195	3,195	3,980	overall length mm	dimensions
1,395	1,395	1,395	1,620	overall width mm	
1,410	1,850	1,880	1,785	overall height mm	
920	1,200	1,170	1,455	unladen vehicle weight kg	weight
0	200(100)	200(100)	--(150)	maximum pay load kg	
2	2(4)	2(4)	9(6)	riding capacity person	
1,030	1,510(1,520)	1,480(1,490)	1,950(1,930)	gross vehicle weight kg	
80	70	65	約20	maximum speed km/h	performance
0.4(21°48')	0.30	0.35(19°17')	約0.3	hill climbing ability tan θ	
4.4	3.8	3.8	4.2	minimum turning radius m	
110	90	75	60	range km (km/h constant speed)	
直巻直流電動機 D.C series motor	直流分巻電動機 D.C.shunt motor	直流直巻電動機 D.C.series motor	直流直巻電動機 D.C.series motor	kind	motor
10・90・1	12.5・84・3'4	10・90・1	7.5・48・1	rated output・voltage・hour kW ・ V ・ h	
トランジスタチョッパ制御方式 Transistor chopper	トランジスタチョッパ制御方式 Transistor chopper	サイリスタチョッパ制御方式 Thyristor chopper	サイリスタチョッパ制御方式 Thyristor chopper	control system	
135SR12	145R12-6PRLT	145R12-6PR	165R13-6PRLT	front	tire
135SR12	145R12-8PRLT	145R12-6PR	165R13-6PRLT	rear	
鉛蓄池・EX150 Lead-acid	鉛蓄池・ED150 Lead-acid	鉛蓄池・ED150A Lead-acid	鉛蓄池・E120 Lead-acid	kind・type	main battery
150 5・12	150・5・12	150/5・12	120・12	rated capacity・voltage Ah/HR・V	
8	8	8	8(並列)	number	
96	96	96	48	total voltage V	
12N24・12	12N24・12	NT60-S4・12	NS40S・12	type・voltage V	auxiliary battery
置形 stationary type	据置形 Stationary type	別置形 Stationary type	別置形 Stationary type	type of setting	charger
定電圧充電 ified constant potential charge	修正定電圧充電 Modified constant potential charge	修正定電圧充電 Modified constant potential charge	修正定電圧充電 Modified constant potential charge	charging control system	
3・200～220・10	3・200	3・200～220・10	(単相200V・50Aも可) 3・200・50	AC input phase・voltage・current φ ・ V ・ A	
8又は1	8	8又は1	10	standard charging hour h	

本自動車工業㈱ UKI MOTOR CO., LTD.	鈴木自動車工業㈱ SUZUKI MOTOR CO., LTD.	manufacturer		
1.17	1.055	overall length m	dimensions	
0.7	0.6	overall width m		
0.9	1.2	overall height m		
71	74	unladen vehicle weight kg	weight	
0	0	maximum pay load kg		
1	1	riding capacity person		
126	129	gross vehicle weight kg		
6.0	4.5	maximum speed km/h	performance	
0.25	0.25	hill climbing ability tan θ		
1.28	0.78	minimum turning radius m		
20	20	range (km/h constant speed)		
マグネット電動機 anent magnet D.C.motor	直流マグネット電動機 Permanent magnet D.C.motor	kind	motor	
0.2・24・1	0.14×2・24・1	rated output・voltage・hour kW ・ V ・ h		
ルレバーによる無段階制御方式 lever control system	アクセルレバーによる無段階制御方式 Mono lever control system	control system		
2.50-4-4PR	2.00-4-2PR	front	tire	
3.50-5-4PR	2.50-10-2PR	rear		
・EB35 acid	鉛蓄池・EB35 Lead-acid	kind・type	main battery	battery
35・5・12	35/5・12	rated capacity・voltage Ah/HR・V		
2	2	number		
24	24	total voltage V		
	—	type・voltage V	auxiliary battery	
置形 nary type	別置形 Stationary type	type of setting	charger	
全自動通角制御電子タイマー付 matic charger with the electric timer	サイリスタ全自動通角制御電子タイマー付 Full auto charger with the electric timer	charging control system		

財団法人 日本電動車両協会

理事長 (㈱日本自動車工業会会長) 豊田 章一郎

昭和51年8月に、我が国の電気自動車の研究開発、実験、普及の中心として、通商産業省のもと、自動車、電力、電機、電池、産業車両、自動車部品、タイヤ、鉛亜鉛等の関連業界により設立されたもので、電気自動車に関する科学技術調査、標準化、試用デモンストレーション、広報活動等を行っています。

JAPAN ELECTRIC VEHICLE ASSOCIATION

President Shoichiro Toyoda

Japan Electric Vehicle Association, established in August 1976 under the guidance of the Ministry of International Trade and Industry, consists of automobile, electricity, battery, electric machine, industrial vehicle, auto parts, tires, lead and zinc, and other related industries interested in research,development, testing, and diffusion of electric vehicles in Japan. Scientific and technological research, standadization, trial demonstration, and public relations as regards the electric car are part of its activity.

電気自動車試用制度

(財)日本電動車両協会では、電気自動車を広く利用していただくためリース方式による試用制度を行っています。この制度では電気自動車の使用に伴い発生する車の修理、車検、電池の交換、現金・自動車保険の支払い等の業務を利用者が行う必要がなくなり、また料金も比較的割安にご利用いただくことができます。当制度に関するお問合せは協会業務部まで。

■Electric Vehicles Trial Use System

Japan Electric Vehicle Association employs a trial use system based on a leasing format for the purpose of widespread proliferation of electric vehicles. In this system, there is no longer the need for lessees of the vehicles to have the obligation of expenses for such things as vehicle repairs that occur along with use of the vehicle, vehicle inspection costs, replacement of batteries, and

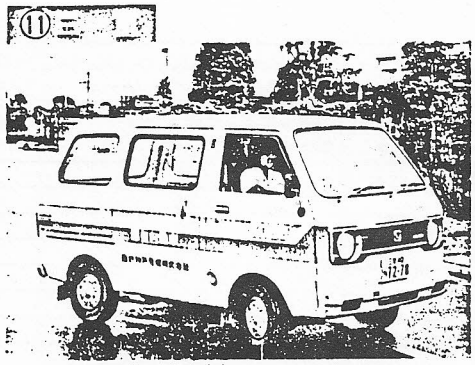
電気自動車は すでに皆さまの街で 活躍しています。

日本全国各地で、オンロード車約680台、オフロード車 約14000台の電気自動車が各種の用途に使用されています。

Electric vehicles widely used throughout Japan

There are about 680 units for on-road and about 14,000 for off-road.

⑪



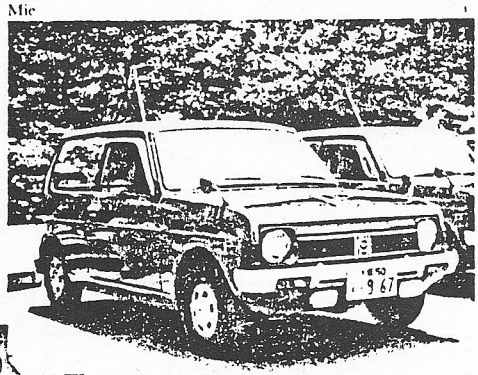
新神戸電機名張工場の業務連絡車
Vehicle for business in the plant of Shinkobe Electric Machinery, Mie

⑨

日本電池の工場案内用バス
Guidecar in the plant of Japan Storage Battery, Kyoto

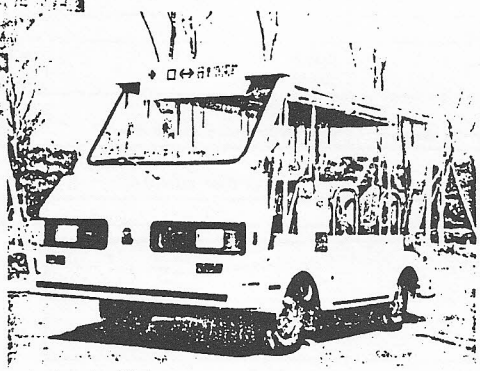
大阪市の公害パトロール車
Patrolcar for environmental pollution of Osaka city

⑫



関西電力のサービスカー
Vehicle for service of Kansai Electric Power Co. Osaka

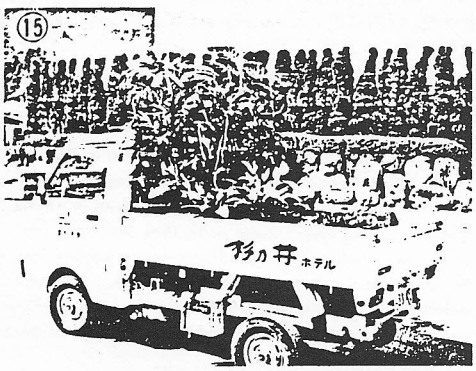
土野商店で酒類の配達車として利用される電気自動車
Delivery van at a liquid store, Osaka



万博記念公園の遊覧車
Sightseeing vehicle in Expo Memorial Park, Osaka

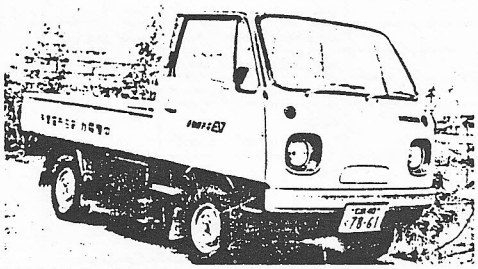
山形・業務連絡車
新潟・電力サービスカー 業務連絡用車
富山・電力サービスカー
滋賀・(草津)遊覧車
福井・業務連絡車
岐阜・電力サービスカー、業務連絡用車
⑨京都・市営バス、業務連絡用車、工場案内用バス
⑩京都(長田野)・マイクロバス、業務連絡用車
岡山・遊覧車、業務連絡用車
⑬広島・電力サービスカー 業務連絡用車
山口・(秋吉台) 遊覧車
⑭福岡 電力サービスカー 業務連絡用車
佐賀・電力パトロール車
熊本・業務連絡用車
⑮大分・業務連絡用車
兵庫・(神戸)・業務連絡車、市バス、作業車 (西宮)電力サービスカー 牛乳配達車
香川・電力サービスカー、遊覧車 (高松) 連絡車
和歌山・業務連絡用車
⑯沖縄・遊覧車

⑮



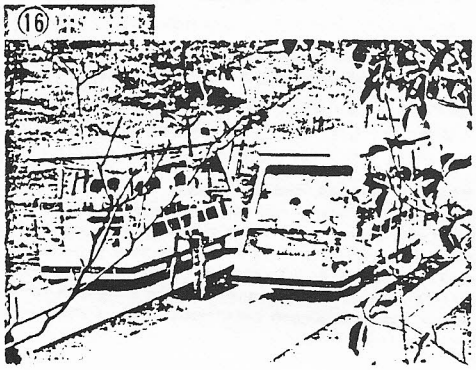
地熱発電の電力を利用する杉乃井ホテルの業務連絡車
Vehicle for business using geothermal power as a source at a hotel, Oita

⑬



中国電力のサービスカー
Vehicle for service of Chugoku Electric Power Co. Hiroshima

⑯



⑭

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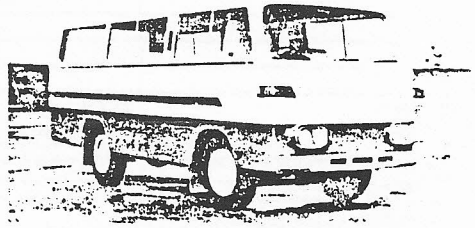


utility companies that collectively account for some 40% of U.S. electricity generation, *as well as major automotive and component manufacturers such as General Motors Corporation (GMC), Chrysler Corporation, Ford Motor Company,* Chloride EV Systems (CEVS), and Powerplex Technologies, Inc.

EV technology development is currently being performed by the U.S. Department of Energy (DOE), the Electric Power Research Institute, and private industry. EVDC works in partnership with these organizations to review market needs and technology R&D priorities. It also plays a significant role in organizing and monitoring joint development programs. Much of EVDC's success can be traced to building good working relationships with DOE, EPRI, manufacturers, user groups, and EVDC member organizations. These relationships are essential to achieving steady and progressive commercialization.

It is interesting to note here that in this very statement, while condemning the Auto industry, EVDC is supported by GM, Ford and Chrysler.

Because the EV represents a substitute for the petroleum-powered vehicle, the automotive industry is not motivated to take the lead in EV commercialization. This situation gave rise to the need for an organization such as EVDC to shepherd EV technology. EVDC's efforts to bring together the various elements necessary for EV introduction represent a model of commercializing a new technology."

4.4.3 Electric Power Research Institute (EPRI), U.S.A.

In a brochure entitled "Building the Electric vehicle Future: EPRI's Vehicle Development Activities", EPRI describes itself:

"EPRI is an independent private, nonprofit corporation supported through the voluntary payments of members. EPRI membership comprises approximately 600 U.S. investor owned, cooperative, municipal, and federal utilities. EPRI plans and manages a program of research, development, and demonstration that assists member utilities and benefits their customers in meeting future electricity needs in the most cost-effective and environmentally acceptable way."

EPRI describes its EV activities as well as those of the U.S. Department of Energy and various electric utilities:

" **Building the EV Industry:** A Coordinated Effort

Current EV development--led by EPRI's Electric Transportation Program, the Electric Vehicle Development Corporation, the U.S. Department of Energy (DOE), major U.S. automobile manufacturers, and specific electric utilities--holds little resemblance to the EV development work of even a decade ago. *Today, EV developers are working together to produce EVs tailored to specific markets.*

EPRI's Electric Transportation Program is an essential part of this coordinated EV effort. Along with battery and component R&D, the Program funds projects that develop and demonstrate road worthy EVs. These whole-vehicle projects--the subject of this publication--include the electric van based on the GM G-Van, the Chrysler TEVan, and "advanced" electric vans featuring batteries and components still under development that will provide longer range and higher performance for the 1990s. *In addition to EPRI, DOE funds advanced-van R&D.*

These projects are part of today's coordinated, nationwide effort to produce EVs that meet specific transportation needs and solve specific transportation problems. This market responsiveness is showing results: production EVs are on the road, plans for next-stage EVs are in place, and advanced EVs suitable for both cargo and

passenger fleet use are on track for the early 1990s."

4.4.4 EV Activities of the U.S. DOE

DOE as an Active Partner in Van Development

In addition to EPRI's electric Transportation Program, DOE funds R&D for advanced, high-performance electric vans. Two DOE programs focus on concurrent development of advanced battery and powertrain technologies.

In the Dual-Shaft Electric Propulsion System Program (DSEP), Eaton Corporation is developing a dual-shaft ac powertrain, which, with an advanced nickel-iron battery made by Eagle-Picher Industries, will be integrated into a Chrysler minivan. In the dual-shaft construction, the electric motor and two-speed transmission operate on separate but parallel axes. This *54-month program* is scheduled to be completed in November 1988.

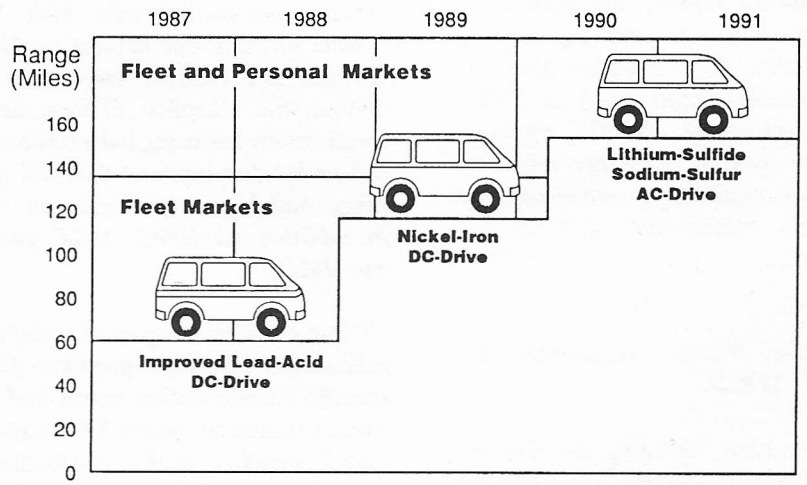
With the Ford Motor Company, DOE is sponsoring the *Second Generation* Single-Shaft Electric Propulsion System (ETX-II) Program. This Program is a *extension* of the ETX-1 Program, in which a proof-of-concept ac drive system for passenger vehicles was developed in 1986. The ETX-II Program will culminate in mid-1988 proof-of-concept propulsion system. This propulsion system consists of Ford's single-shaft ac powertrain and a sodium-sulfur battery. The powertrain integrates a two-speed transaxle and an ac motor that are packaged as a unit and arranged concentrically on the drive-wheel axis."

4.5 EV Activities of Various Electric Utility Companies

Who is helping EPRI, DOE, and automobile manu- facturers bring new electric vans to the production stage?

Electric utilities. For instance, with EPRI, the Tennessee Valley Authority cofunds the Electric Vehicle Test Facility in Chattanooga, Tennessee, where all promising new EVs are tested before being marketed by the Electric Vehicle Development Corporation. With EPRI, the Southern California Edison Company is cofunding development of the Chrysler TEVan. Cofunding for other EV projects such as extended-range EV development will come from Arizona Public Service Company and the Los Angeles Department of Water & Power.

Although this utility backing is critical, the future of the EV industry as a whole. This



Evolution of the EV market is directly dependent on breakthroughs in EV technology. Two key improvements, a high-performance battery and an ac powertrain, should give EVs the range and performance capabilities to compete in a broad mix of transportation markets, including the vast personal car market.

support is needed to seed the development of the market and to help establish the infrastructure for this promising technology."

EPRI's electric transportation program is continuing to sell itself to electric utilities.

"How can your utility help?

The best way to get involved in the exciting future of EVs is to try the vehicles firsthand. Contact EVDC to arrange a test-drive of a GM Griffon electric van and obtain ordering information for the new electric G-Van. The G-Van will be available in late-1988. Buying one to use as a utility-fleet and public-relations vehicle is the most direct way to convince your utility and your commercial customers of the benefits that EVs offer in cost savings and dependability.

In guiding the development of the EV industry, EPRI's Electric Transportation Program is helping to introduce products that could mean major new load and business opportunities for electric utilities. The time to support the Program and the future of electric vehicles is now."

4.6 Status of Electric Vehicles in Various Countries

4.6.1 Future of EVs in Japan

The future of EVs in Japan is described in a Mini Guide to Electric Vehicles published by the Japan Electric Vehicle Association. It also reviews the situation around the world.

"Electric Vehicle Council worked out a long-term plan called the "basic plan to popularize electric vehicles" with the aim of reaching the annual yield of 10,000 and the owned number of 15,000 (5,000 on-road and 10,000 off-road) vehicles by 1990.

Popularization of electric vehicles largely depends on society's concern about environmental preservation, energy supply and demand trend, and other socio-economic situations. However, the primary factors that definitely determine popularization of an electric vehicle are believed economy and performance obtainable with it.

The realization and even small-scale production of electric vehicles depend on the development of economical production methods. Improving economy means increasing demand and making mass production possible.

The performance of an electric vehicle is affected to more or less great measures by performance of the batteries used, which fact justifies the view that the authentic popularization of this vehicle category may depend on the development of really satisfactory, efficient batteries.

In Japan, various new types of batteries for power storage have been developed in researches under the sponsorship of the national government. The techniques employed in them are highly expected to be applied to developing a battery for electric vehicles.

The widespread use of electric vehicles would normalize electric-power loads, increase demand for electric power, and diversify energy sources and would therefore exert great influence on the activities of electric power and on various other fields.

The Ministry of International Trade and Industry report entitled "Energy Outlook for the Twenty-first Century" places importance on the electric vehicle as a future transport-energy form.

Electric power companies are importing electric vehicles from overseas for actual evaluation and are energetically engaged in the development of new models.

In the U.S.A., on the other hand, large sums of funds have been invested in the research and development of a new battery from multiple angles. In Japan, further cooperation from every field of the related industries as well as understanding and consensus are required

to promote the development and popularization of an electric vehicle so that Japanese technology in this field can become highly competitive with the United States."

4.7 U.S.A.

"Research activities,, including those of the Department of Energy (DOE) and of electric power companies and other research organizations are currently employing about 600 on-road electric vehicles, although the total of such vehicles on the road in the United States is estimated to be several thousand.

Although this work had an annual budget of millions of dollars, at the time, recent changes in government policy have reduced the figure. Moreover, emphasis has been shifted to fundamental development in the fields of batteries and dynamics structures. Work in these basic departments has begun and is proceeding steadily.

Employment results of governmental developmental work, the private sector is hurrying to make great investments on its own in the development of vehicle bodies, motors, and new battery types.

Electric power companies are putting great hopes in the electric vehicle because of its effects in increasing power demands and normalization of load. The Electrical Power Research Institute (EPRI), funded by several electric power companies, is engaged in communal research with the DOE and on its own plans for the electric vehicle as an effective power-utilization method. In pace with these activities, such electric power companies as the Tennessee Valley Authority are eagerly carrying out their own experimentation.

With funding from electric power companies and with assistance from EPRI and DOE, the Electric Vehicle Development Corporation (EVDC) has been formed to establish a system for introducing and supplying electric vehicles to electric power companies and is becoming a leader in the popularization of such vehicles in the United States."

4.8 Europe

"The countries of the European Community are enthusiastically going ahead with research and popularization of electric vehicles. In each nation, electric power companies are taking the lead in research and development. Within the EC framework, in April, 1978, AVERE (The European Electric Vehicle Association; headquarters in Brussels, Belgium) was founded, in cooperation with member nations, to promote the popularization of electric vehicles. The EC provides some financial assistance to research in this field in each nation. Furthermore, EC as a whole is engaged in the following electric vehicle research and popularization activities.

Development of electric vehicle batteries as part of the Research and Development Plan, one of the themes of EC energy-conservation study.

Study of the introduction of electric vehicles and the dual-mode bus as part of Cost Planning, a communal undertaking of the European nations in the field of scientific technology and research."

4.9 Great Britain

"With a total on the road of about 35,000, England uses more electric vehicles than any nation in the world. It is said that virtually all milk delivery trucks in London are of this type. In addition, electric vehicles are used for newspaper delivery and as electric power company service trucks. Although most of these are low-speed models, research is currently directed toward the development and popularization of high-performance electric vehicles.

As part of the "London Goes Electric" plan for Greater London, a number of electric vehicles were put into experimental usage; and the economy of their operation was analyzed. In addition, with assistance from the EC, plans

for the development and introduction of hybrid vehicles are going forward.

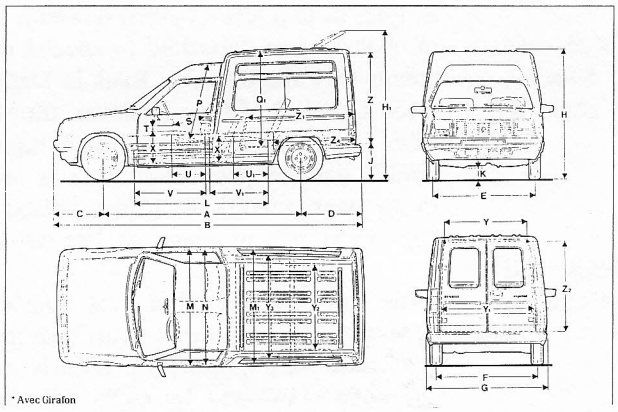
In the private sector, with assistance from the Electricity Council and the Department of Trade and Industry, enterprise groups are actively engaged in research and development on high-performance batteries and bodies."

4.10 France

"As a part of their research, development, and popularization activities, recently an organization centering on the French Power Public Corporation has been testing well over a hundred electric vehicles. Hybrid (battery-trolley and battery-diesel) buses are operating in the cities of Nancy and Tours. With EC assistance, a group centering on automotive manufacturers is engaged in research on high-performance vehicles and new battery types.

In France, electric vehicles are most widely used for refuse collection. About 300 such collector vehicles are currently operative in Paris, and several have been exported for use in Belgium."

RENAULT express électrique



* Avec Girafon

Hybrid vehicles still burn fuel and pollute...

4.11 West Germany

"The central element in West Germany's planning for research, development, and demonstration was the Electric Road Traffic Committee, a subsidiary of RWE, the nation's largest power company. With financial assistance from the federal government (Ministry of Research and Development and Ministry of Transportation) and from the provinces, this plan has introduced about 70 small vehicles and small delivery vans into more than 10 cities, has put about 20 electric buses into operation in Dusseldorf, and has initiated research into the development of an electric bus with a new kind of battery-charging system.

In addition the authorities have put 20 hybrid (battery-diesel) buses into operation in Stuttgart and 20 hybrid (battery-diesel and trolley-diesel system) buses in Esslingen and Essen.

Having fulfilled its purpose, in 1987, GES was absorbed into RWE, which now does its own electric vehicle research and development. With assistance from the Ministry of Research and Development, research and development in the fields of batteries and motors are progressing steadily."

4.12 Italy

"In Italy various kinds of research and development in electric vehicles are being conducted, with EC assistance, by the Ente Nazionale per L'Energia Elettrica, the Societa Italiana per L'Esercizio Telefonica, and the Consiglio Nationale delle Ricerche. In addition to test-operation more than 10 commercial vehicles in several cities, they are developing and recommending the application of small and hybrid

buses and are conduction research and development activities in conjunction with private companies and public organizations."

4.13 Other Countries

"Zermat city in Switzerland uses 200 units of EV and carriage instead of internal combustion engine vehicles for environmental preservation.

In Holland a public traffic system is now in operation employing EV as public rental car called "witcars". Besides development activities have been carried out by university.

In Belgium and Denmark development activities have been carried out in the Universite Libre de Bruxells in its campus.

In addition to using a small number of electric vehicles for postal delivery, Finland, Sweden, and Austria are engaged in various kinds of research and development.

Countries Outside Europe

Australia, Taiwan, India, Hong Kong, and China are developing electric vehicles and investigating their application."

4.14 Forecast Evolution of the Electric Vehicle Industry

Eight potential markets for the EXAR-1 electric automobile have been identified:

1. Research facilities and organizations involved with electric automobiles.
2. General Public
3. Economically oriented purchasers
4. Environmentally concerned purchasers
5. Car buffs
6. Car fleet operators
7. Technically oriented early adopter buyers
8. Environmentally legislated demand in area with localized air pollution problems.

The inventor of the EXAR-1 feels that the car will sell well to the general public based on his actual experiences at trade shows, where thousands of orders were placed for purchase of the EXAR-1.

The real and practical experiences at these shows and expositions have simply confirmed market potential as described in a number of market studies. The indication by these studies that thousands of electric automobiles could be sold to the general public has been confirmed in actual receipt of thousands of orders, some with deposits as high as one thousand dollars, ($1,000.00) per order. Hundreds more orders have been received from radio shows in which the inventor has participated and even after the listeners had been advised that orders were not being taken and that production might be as long as two years before delivery. Hundreds of checks were deposited in special escrow accounts with the Reunion Bank in Dallas, Texas. Over a period of time however, the depositors have been asked to take their money back until a definite production date is announced. From bank records it is determined that orders were still in place as late as 1986.

The confirmation of a vast number of the general public prepared to purchase the EXAR-1 as soon as a production date is announced has been confirmed by radio talk show hosts on whose talk shows Mr. Ramirez has appeared.

Public Petroleum, in order to get an idea of the acceptance of the EXAR-1 has held a number of small displays in order to get market feedback. In each and every instance where the car was displayed at a public facility, the response has been overwhelming. Since these displays were not in advantageous or in consumer oriented areas, the response was more than significant.

Like many technical entrepreneurs the inventors' actions in developing the car were based on a market opportunity. Ramirez has developed a unique plan for the innovative commercialization of the electric vehicle industry

and the advantages of returning to a system used in the early 1900's by setting up regional assembly plants for a vehicle far less complicated than conventional gasoline vehicles offers tremendous advantages to both the public and the manufacturing facility. In developing the prototype from 1973 to 1979, the inventor was, and still is, ahead of his time. Following information suggests that the timing is now right to begin electric vehicle assembly plants.

The large amount of activity in the electric vehicle industry in the 1980's, in many countries, by some very credible organizations, suggests that an electric vehicle industry will start to get off the ground in the late 1990's unless the EXAR-1 is produced before that time.

A large number of surveys prepared on the potential market all indicate several thousands of electric automobiles could be sold if produced. The latest surveys have been geared to electric trucks because of the influx of participants in the truck field. These same surveys are self serving and have been developed under the auspices of these same truck and van oriented organizations. This group of opportunists are deceiving the public in that none of them have done any *basic research,* they have simply converted gasoline trucks and vans to electric power. A close study of the current background of electric vehicle development indicates that the majority of American and Japanese automobile companies have placed their attention in the electric vehicle market on trucks and vans limited to short distances and light weight delivery. Since these automobile companies provide the vans and trucks which are being converted they also encourage this area of production. Their influence provides a negative impact on the development of passenger electric automobiles.

The automobile industry certainly has no interest in the commercialization of a passenger electric vehicle whose innovations contrast current automobile technology in the same way that the transistor affected the vacuum tube industry. The technological advances in production, repairs and maintenance, sales and distribution, of the EXAR-1 as proposed by Mr. Ramirez represents the transistor advancement in electric car manufacturing versus the vacuum tube position of current gasoline automobile production.

Papers, and long term market development plans, exposed at the Seventh Annual Electric Vehicle Symposium, provided almost identical market development plans as presented in the late 1970's with the exception that the emphasis in this show changed from electric passenger vehicles in the late 1970's to truck and vans in the late 1980's. It might be considered that this change was due to the lack of acceptance by the general public in an electric automobile, however, in closer study, it is obvious that since the abdication of the EXAR-1 in 1981 there has been no other real electric passenger automobile to step forward and fill the gap. The years of costly research and development which were required to produce the EXAR-1 have not since been duplicated by any other organization that we have been able to uncover. Since the transition from gasoline truck or van to electric power requires little or no research and development, or technological expense, this has been the path of least resistance taken by the entire electric vehicle industry as is reported currently. We have been unable to find any other electric passenger vehicle which has extended either the research and development or the investment required to design and produce an electric passenger automobile. All other passenger automobiles in the electric vehicle field have been conversions of existing automobiles. With few exceptions that date back to early 1980, excluding golf cart type vehicles, those few vehicles which were independently designed were not of the caliber of the EXAR-1 and in effect, amateurish attempts at a limited manufacturing capacity.

Through the majority of the research required to prepare this report, the phrase "long term market development plans" seem to emphasize the word 'long' and dating back to

the late 1970's, the same phraseology has not changed, only the dates have been moved up from the late 1980's now to the late 1990's, but all other aspects of that elusive development plan seems to have remained the same. Another coincidental phrase found throughout the research and dating back to the late 1970's has been "Three Phase" plan, outline, or development program, etc.. Examples of these types of reports are shown in the Exhibits and they have not changed since 1977. In a recent survey prepared by Maritz Marketing Research Firm conducted in March of 1988, they rated the importance of operating attributes as follows:

Attribute	% Important Score
1. Needs fewer repairs	92%
2. Lasts longer	88%
3. Fully warranted	87%
4. Avoids gas price increases	82%
5. Non-polluting	67%
6. Less engine noise	28%
7. Unique and noticeable	23%

In areas with high pollution, the non-polluting aspect was almost as important as the economic attributes.