A Case for a DaimlerChrysler Hybrid Minivan

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Executive Summary

The Japanese companies have a head-start in hybrid technology and have consistently been taking market share from DaimlerChrysler in the minivan market.

We analyze the current minivan market and the trends in the commercialization of the hybrid technology. We conclude that DaimlerChrysler must move swiftly to neutralize the competitive threat posed by the planned introduction of the Japanese hybrid minivans by developing a hybrid minivan of their own.

What are hybrids?

A hybrid vehicle combines an internal combustion engine and an electric motor. The two major benefits of the hybrid technology are:

- Improved fuel economy
- Lower emissions

Hybrids combine two mature technologies and are already on the market.

Current Minivan Market

Minivan Market Overview

Although DaimlerChrysler remains the leader in minivan sales in the United States, their supremacy is being challenged by the Japanese minivans: the Toyota Sienna and the Honda Odyssey. Jim Hossack, a market consultant and minivan expert for AutoPacific, one of the auto industry's top research firms says, "Minivans' share of the industry is down a little bit from 8 percent in the late '90s to 6.5 percent this year, but the big news is that the domestics are losing their share of the segment significantly, while the imports are gaining. Toyota is gaining significantly with the Sienna, Honda with the Odyssey and Kia with the Sedona. Ford, GM and Chrysler are all losing." (Exhibit 1).

Exhibit 1: 2004 minivan market shares in the US. *San Antonio Express-News (Texas), November 7, 2004, METRO.*

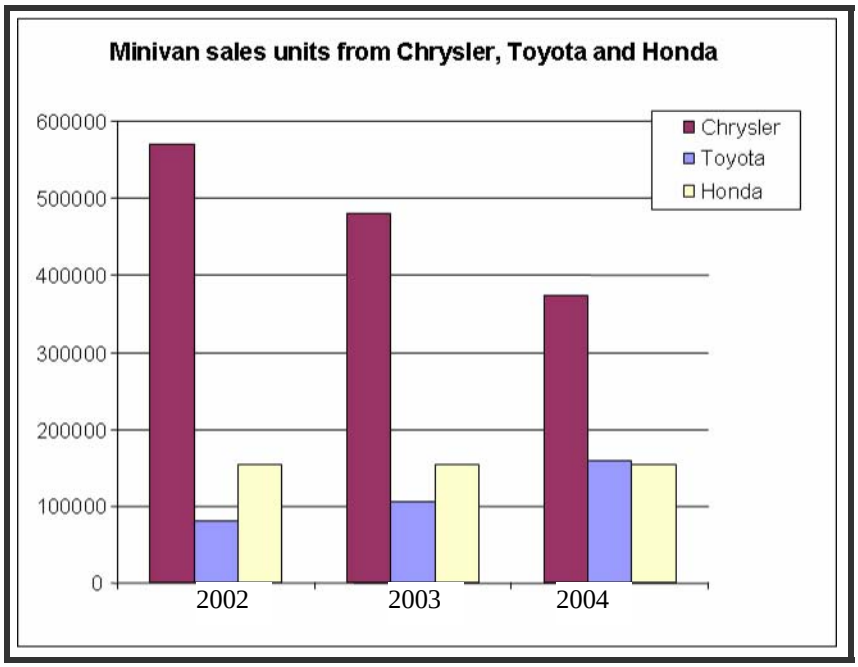
Company	Market Share (%)
DaimlerChrysler	33.8
GM	14.9
Toyota	14.4
Honda	13.2
Ford	11.3
Kia	5.8

Rivalry

The Toyota Sienna won the 2004 J.D. Power and Associates award for *Most Appealing Compact Van*, leaving the Chrysler Town and Country far behind. For the Consumer Choice Awards at the 2005 National Automobile Dealers Association (NADA) Convention in New Orleans, Toyota Sienna won the award for *Most Requested New Minivan*.

Exhibit 2 shows the sales figures for minivans for Chrysler, Toyota and Honda in 2002-2004. While Chrysler's sales are declining, the Japanese automakers are gaining ground.

Exhibit 2: US minivan unit sales from Chrysler, Toyota and Honda. *Compiled from annual reports of the companies.*



Toyota began mass-producing two hybrid minivan models, Estima and Alphard, in Japan in 2001 and 2003 respectively. Estima is marketed in the US as Sienna, and an introduction of a hybrid version of the Sienna in the US is planned for 2007.

Meanwhile, Keith Naughton, Newsweek's Detroit bureau chief covering the auto industry for 16 years, reports that Honda has engineered its new Odyssey minivan to accommodate a hybrid powertrain option without losing any cargo space or the ability to fold the third row seats into the floor. An introduction of a hybrid version of the Odyssey in the US is planned for the end of the decade.

Toyota has already successfully marketed a hybrid car, the Prius, in the US, and has earned a reputation for innovation and environmental friendliness. The planned introduction by Toyota and Honda of hybrid versions of already popular minivans poses a major competitive threat to DaimlerChrysler's market leadership. Naughton believes that DaimlerChrysler will have to respond by introducing its own hybrid minivan.

New Entrants

All the big players: DaimlerChrysler, GM, Ford, Toyota, Honda, Kia, and Nissan are already in the market. Existing customer base, brand name recognition, and direct experience in manufacturing and marketing minivans are important ingredients for success. New entrants with no prior experience in the minivan market are unlikely to be a problem for DaimlerChrysler.

Customers

Buyer Bargaining Power

Buyers of minivans are primarily individuals and do not command significant bargaining power.

Who buys a minivan?

The typical minivan purchaser is most often a fairly affluent married couple in their 40's with children. In the past decade the same demographic has been targeted by a substitute

product - the sports utility vehicle (SUV). SUVs are roomy, crash-resistant and powerful, and are therefore appealing to families with children. They have become popular with consumers and have outnumbered passenger cars since 2002. In spite of the success of the SUVs, minivans are still popular with a substantial number of customers.

Studies show that the difference between SUV buyers and minivan buyers doesn't have much to do with income, occupation, age, family size, or geographic location.

Keith Bradsher, in his July 17, 2000 New York Times article emphasizes the psychological differences between minivan and SUV buyers and gives the following two examples:

- In the spring of 2000, Strategic Vision, a San Diego market research company that does a lot of work for the auto industry, conducted a survey of 19,600 recent car buyers, including 5,400 minivan and SUV buyers. Its findings show that a greater percentage of minivan buyers than SUV buyers are involved with their communities and families. Minivan buyers are more likely than buyers of any other kind of vehicle to attend religious services and to engage in volunteer work, while SUV buyers rank with pickup truck buyers and sports car buyers as the least likely to do either.

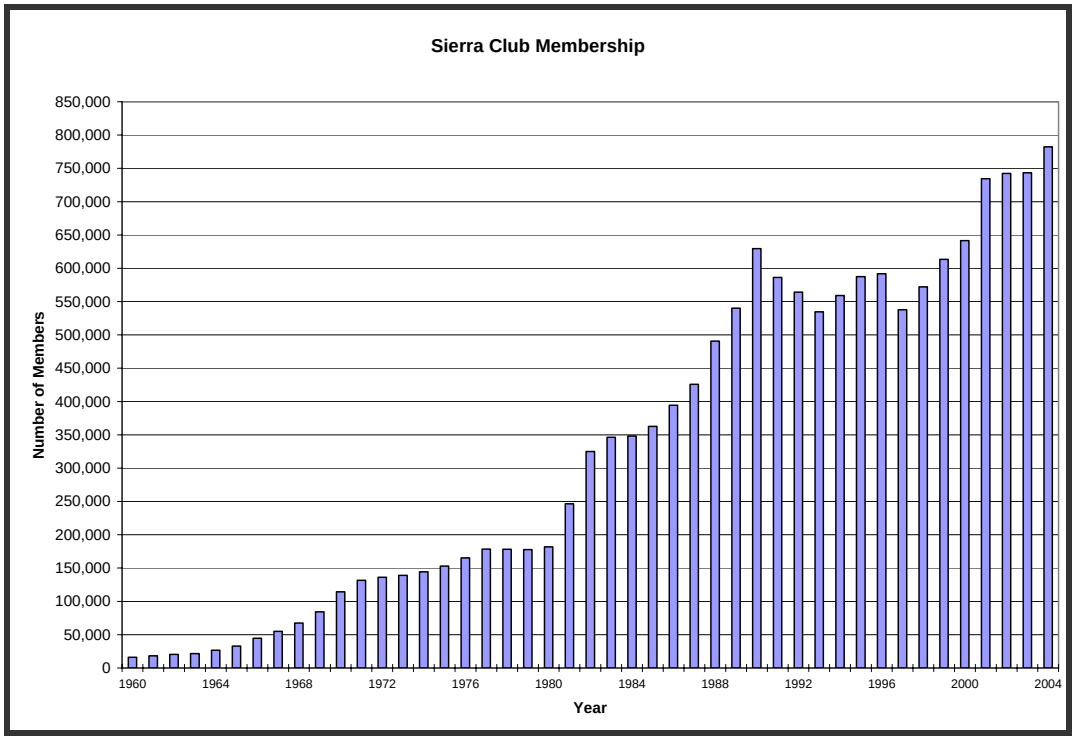
- A quote from David P. Bostwick, DaimlerChrysler's director of market research: "Sport utility people say, 'I already have two kids, I don't need 20,' Then, we talk to the people who have minivans and they say, 'I don't have two kids, I have 20 - all the kids in the neighborhood.' "

Typical minivan buyers are people who care about their communities, their children, and their children's future. This is a strong indication that minivan buyers will be concerned about the environment, as a healthy environment means better living conditions for their children, and their communities.

The Green Citizen

The Sierra Club labels itself as “the most effective advocate for the environment in America”. Total Sierra Club membership is rising (see Exhibit 3). This indicates a growing interest in the United States in maintaining a healthy environment. The percentage of Sierra Club members relative to the US population has risen from 0.08% in 1980 to 0.26% in 2003.

Exhibit 3: Sierra Club Membership in the US.



The Economics of Owning a Hybrid

A J.D. Power and Associates report from March 06, 2002 indicates that as many as 60% of new car buyers would consider a hybrid option, overwhelmingly in the same segment as their current vehicle. The number one reason for consumers to consider a hybrid is the

concern over high fuel prices. However, when making the purchasing decision consumers weigh the benefits of fuel economy against the higher of cost of hybrid vehicles.

Exhibit 4 shows J.D. Power and Associates projections for fuel economy and the retail prices of hybrid and conventional vehicles in different categories.

Exhibit 4: Cost and fuel efficiency data from J.D. Power and Associates

Type	Price ICE	Price Hybrid	Price diff.	mpg ICE	Mpg Hybrid	Improvement
Compact	15,911	20,084	4,173	37.4	50.3	34.5%
Midsize	19,969	22,953	2,984	26.0	32.4	24.6%
Luxury	50,863	54,363	3,500	21.0	27.3	30.0%
Pickup	29,174	30,729	1,555	16.9	20.1	18.9%
SUV	26,938	29,494	2,556	20.4	28.0	37.3%
Minivan	29,735	33,735	4,000	20.4	28.3	38.7%

These projections are close to the actual numbers observed in the market today for the vehicles with a hybrid option such as the Honda Civic (compact), Ford Escape (SUV), and Chevrolet Silverado (Pickup) (see Exhibit 5). The fuel savings are especially significant for minivans.

Exhibit 5: Comparison of prices and fuel efficiency for hybrid vehicles sold in the US

Type	Price ICE	Price Hybrid	Price diff.	mpg ICE	mpg Hybrid	Improvement
Honda Civic	18,100	21,100	3,000	40	48	20%
Ford Escape	23,640	26,970	3,330	25	34	36%
Chevy Silverado	32,000	34,500	2,500	17.5	19	9%

A detailed analysis of lifetime cost of hybrid and internal combustion engine vehicles was released in 2003 by the UC Davis Institute of Transportation Studies. Assuming technology similar to the one on the market today, and a vehicle life of 170,000 miles, the price premium and breakeven gasoline price were calculated (Exhibit 6).

Exhibit 6: Hybrid option price premium and breakeven gasoline price

Type	Price premium	Breakeven gas price
Compact	2,700	2.03
Midsize	2,800	1.82
Pickup	3,800	1.93
SUV	3,500	1.94
Minivan	3,200	1.79

The following interest rate assumptions were made:

- 7% new car financing rate
- 6% opportunity cost of money for auto manufacturers
- 3.9% interest rate for the consumer "opportunity cost" of purchasing a vehicle relative to alternative uses of the same money.

The breakeven prices are close to the national average for gasoline - $2.00 a gallon as of March 7th 2005. At this price, owning a hybrid makes economic sense on the basis of fuel savings alone. Of all types considered, minivans break even at the lowest price.

Clean Fuel Technologies

Gasoline is made from oil, a non-renewable source of energy. Auto company executives from Detroit and Japan all agree that the future modes of transportation are either fuel-cell vehicles or electric powered vehicles whose sources of energy can be produced from facilities that make use of solar, wind, or hydro power to produce hydrogen or electricity.

Other intermediate substitute products include alternative fuel vehicles, diesel vehicles and improved gasoline vehicles:

Electric Vehicles (EVs)

Electric vehicles use batteries and are non-polluting. They also do not suffer from engine noise and vibrations, resulting in a quieter and smoother ride with quicker acceleration. The main drawbacks are their limited range between charging, expensive bulky battery packs, and a long recharging time.

Power outlets for recharging are widely available. However, most electrics can only travel under 120 miles per charge that often takes more than two hours. Advances in material science and chemistry have continuously improved the battery technology.

Currently, electric vehicles are expensive to car buyers. The small production volume of battery packs means a higher sticker price than comparable gasoline vehicles. For example, Ford's EVs sell for $32,900 and GM's EVs for $35,000. Lower fuel costs and less maintenance due to fewer moving parts help offset the initial cost. Sticker prices should drop once enough electrics hit the road. There are already a number of electric vehicles on road from GM, Ford, Chrysler, Toyota and Honda. These vehicles are popular among fleet operators.

Fuel Cell Vehicles

These vehicles are touted as the future of transportation. They harness power through the reaction of hydrogen and oxygen, and can run on a number of different fuel sources, including hydrogen and methanol. However, only pure hydrogen will not produce smog-forming pollutants. Today, the performance of fuel-cell vehicles matches that of conventional vehicles. Major automakers have already invested billions of dollars to make this technology viable. As a result, fuel cell vehicles are already in a few cities' bus fleets. Passenger car prototypes have been on the road since 2000.

The average sticker price of a fuel-cell vehicle is triple that of a conventional vehicle. The latest fuel-cell engine alone costs more than $30,000. A sophisticated battery pack, complicated fuel delivery and storage system and other high-tech structures present significant additional costs. Unless a more efficient production process and economy of scale can be achieved, ordinary car owners will not switch over.

Fuel cell technology is far from becoming a commercial reality, and safety concerns about the use of hydrogen have not been fully addressed. The absence of a complementary hydrogen gas station infrastructure is the real obstacle. It is estimated that $400 billion will be needed to install hydrogen refueling stations across the nation.

Alternative Fuel Vehicles

Compressed natural gas (CNG), liquefied petroleum gas (LPG), methanol (M85), ethanol (E85), and hydrogen fuels offer emissions benefits over gasoline. These fuels are particularly well suited for use in vehicle fleets. For the passenger car market, alternative fuels offer an important step toward a clean car future that combines advanced technology and clean fuel.

Greener Conventional Vehicles

Advances in the internal combustion engines, such as cylinder disconnection and variable valve control have made gasoline and diesel vehicles more energy efficient and less polluting. Statistics indicate that fuel efficiency has improved by as much as 23% in some highly advanced conventional vehicles. For example, VW Jetta diesel cars can achieve a combined 45 mpg.

Supply Chain Analysis

The main components inside a hybrid vehicle are batteries and electric motors. The suppliers' capabilities greatly affect the launch schedule of any hybrid model. There is a shortage of American suppliers capable of producing key hybrid components.

For example, Ford was forced to acquire the majority of key components for Escape Hybrid SUV from Japan and Europe: battery packs from Sanyo Electric, transmissions from Aisin AW, and regenerative brakes from Continental Teves. Phil Martens, Ford's executive vice-president of product development observes: "We don't have battery suppliers that can deliver [a beefy battery pack necessary to create a hybrid car], we don't have regenerative brake suppliers that can deliver what we need, and we do not have the level of software engineering that we need. A bigger issue is the lack of American hybrid component suppliers." Working with suppliers thousands of miles away in different time zones created challenges that contributed to the delay of the Escape Hybrid project by almost a year.

Toyota faced a similar challenge when it began developing the hybrid technology in the early 1990s. At the time, few automotive suppliers in Japan had expertise necessary to supply components for a hybrid car. As a result, the management team set out plans for engineers to develop in-house expertise in key areas, such as battery and regenerative braking technology, and computer control systems for switching seamlessly between the internal combustion engine and the electric motor. Toyota then worked with suppliers to transfer knowledge and skills to design and manufacture key hybrid components.

Improvements in key hybrid technologies and accumulation of expertise among the suppliers is a critical complement for success in the hybrid car market.

Regulatory Environment

Congress extended the initial tax break of $2000 for the vehicles sold in 2005 (*IRS Publication 535*). The qualifying certified hybrid vehicles were: Ford Escape Hybrid, Honda Civic Hybrid, Honda Insight, and Toyota Prius. The tax break is scheduled to be reduced to $500 in 2006, and to be phased out in 2007. By that time, mass-market production of hybrid vehicles is likely to reduce production costs making the tax break less important in stimulating sales of clean fuel vehicles.

In addition to the tax break an important incentive on the manufacturer's side are the Corporate Average Fuel Economy (CAFE) standards regulated by the National Highway Traffic Safety Administration (NHTSA). These standards require that the total mpg average for all vehicles sold by a company in a particular category must exceed a certain limit. These limits are currently set at 27.5 mpg for passenger cars, and 21.0 mpg for light trucks. The penalty for failing to meet these standards is $55.0 per 1 unit of mpg deficit per car. The requirement for light trucks will gradually increase to 22.2 mpg by 2007. Congress specified that CAFE standards must be set at the "maximum feasible level," therefore the fact that hybrid vehicles have entered the market is likely to put pressure on the NHTSA to keep adjusting the standards higher. In 2004 DaimlerChrysler had 29.7 mpg CAFE for passenger cars and 21.3 for light trucks.

Manufacturers have a strong incentive to make the average for the entire fleet satisfy the requirements. The use of hybrids can help increase the average and give manufacturers more flexibility in producing higher-power vehicles popular with consumers.

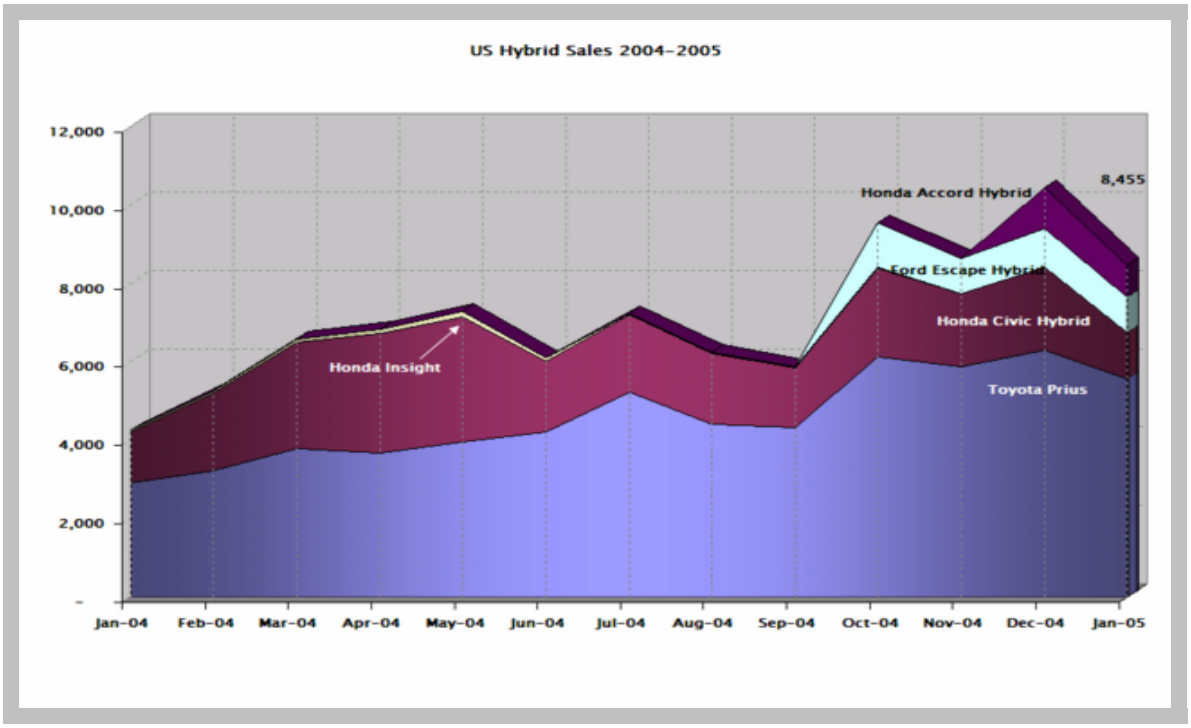
The other option for the companies is to lobby Congress to leave the CAFE standards unchanged. Auto companies have been very successful at this, and CAFE standards have changed very little since 1990. The usual argument is that increasing the standards will encourage production of lighter vehicles that are less safe.

Through at least 2007, CAFE standards do not seem to be a major problem for DaimlerChrysler.

Hybrids in the US market today

The sales of hybrids in the US doubled in 2004 reaching 85,699 units. The market has been dominated by the Toyota Prius and other passenger hybrids, but Ford's Escape SUV hybrid was off to a good start (.).

Exhibit 7: US hybrid sales in 2004-2005 (*Greencarcongress.com)*



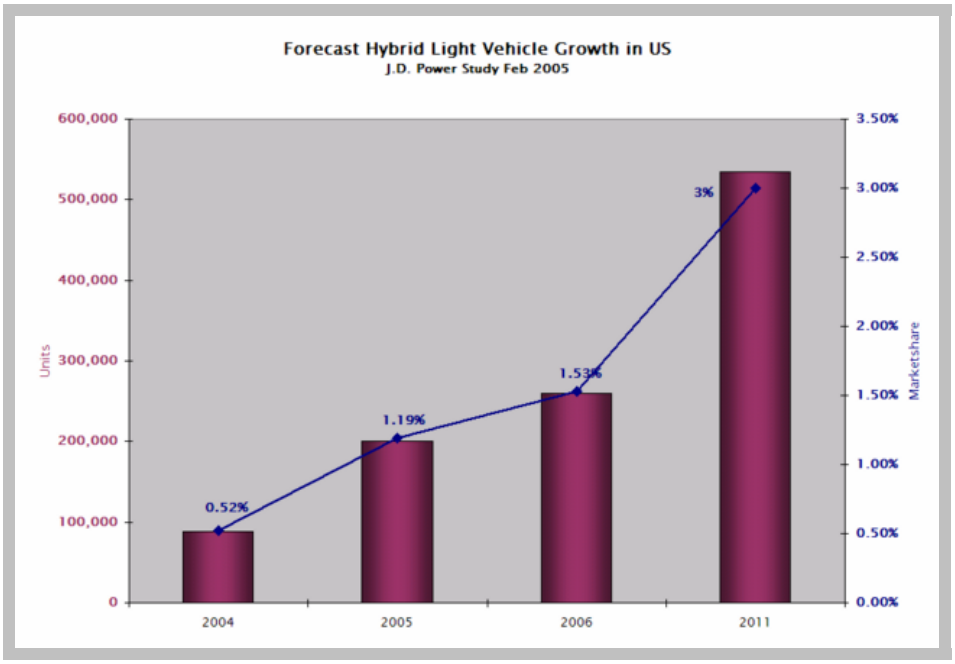
Hybrids have gone mainstream, and many more models in different vehicle categories are expected in the coming years (Exhibit 8).

The sales of hybrids in the US are projected to grow rapidly, even by conservative estimates (**Exhibit 9**).

Exhibit 8: Planned hybrid vehicle product launches.

Model	Type	Availability
Honda Insight, Civic, Accord	Sedan	Now
Toyota Prius	Sedan	Now
Chevrolet Malibu	Sedan	2007
Nissan Altima	Sedan	2007
Ford Escape	SUV	Now
Lexus RX 400h	SUV	2005
Toyota Highlander	SUV	2005
Mercury Mariner	SUV	2005
Toyota Sienna	**Minivan**	**2007**
GM Silverado & Sierra	Pickup	2005
Dodge Ram	Pickup	2005

Exhibit 9: Projected hybrid light vehicle growth in the US. (*Greencarcongress.com)*



A more optimistic prediction by Booz Allen Hamilton has hybrid cars making up 20% of the overall car market by 2010.

Recommendations

The Japanese companies have a head-start in hybrid technology and have consistently been taking market share from DaimlerChrysler in the minivan market.

The DaimlerChrysler minivan position is especially in danger because of the planned launch of the hybrid versions of the Toyota Sienna and Honda Odyssey minivans.

Daimler Chrysler must move swiftly to neutralize this threat by leveraging their existing leadership position in the minivan market. We recommend the following strategy for DaimlerChrysler:

- Embrace the hybrid technology and develop a hybrid option for their minivan lineup. Minivan is the only untapped hybrid market in the USA. DaimlerChrysler must be a leader in technological innovation to preserve its leadership in minivans.
- We suggest introducing the hybrid option first for the more upscale Town & Country minivan, because the buyers of that model are less price sensitive.
- DaimlerChrysler should use the hybrid option as an important differentiating feature. It can also be used to improve the minivan image and make it more hip to drive
- Because DaimlerChrysler is behind the Japanese in technology development, we suggest developing the technology jointly. The existing partnership with GM is a step in the right direction.
- Hybrids have the potential for immediate impact in the marketplace, we suggest shifting development resources from the fuel cell program to hybrids.
- DaimlerChrysler should develop marketing campaigns to educate the public about how hybrids function to prepare the loyal DaimlerChrysler customer base for the introduction of a hybrid minivan.