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The future and outlook of alternative fuel bus industry and its marketing strategy

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THE FUTURE AND OUTLOOK OF ALTERNATIVE FUEL BUS INDUSTRY AND ITS MARKETING STRATEGY

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Business Administration

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by

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ABSTRACT

According to the current governmental regulations, all diesel buses will be replaced in the United States and European market within the next ten years. There are over 60,000 buses in the United States and each year over 3,000 new buses of approximately 40 feet in length are purchased. The bus market has a growth rate of four to five percent per year over the last two years. The improvements in technology offered by United States companies prove unsatisfactory in terms of bus performance and the emissions of new buses. The energy crisis in the United States and concern over the health hazards of the diesel fuel exhaust gases and particulates, alternative fuel vehicles are in great demand in the transit market worldwide. This demand was driven by mandates for alternative fuel transit buses as in California that will affect transit agencies with more than 15 buses in their fleets.

ACKNOWLEDGMENTS

This project is the final result of two years of mental and physical work in the process of obtaining my Masters degree from Master of Business Administration program at California State University, San Bernardino. It has been a really difficult two years, but I could not have done it by myself. I had the help and support of family, friends, instructors and many others who constantly reminded me, "Never give up if you have gone this far."

I thank and acknowledge the following individuals for their gifts of love, financial and emotional support, education, wisdom, and understanding: Dr. Norton Marks, who guided and advised me through this project study, Dr. Eric Newman, who was the second reader of the project, and Dr. Vic Johar, who is the Chair of Department of Marketing and always willing to give me some good ideas to do a better job, Dr. Sue Greenfeld, who has constantly helps me in all aspects of my academic study for the past two years, Professor Beth Flynn, who always helps me out if I have any problems in school, and all the administrative staff, instructors, professors and clerical staff in the Department of Marketing at California State University, San Bernardino, my parents and my girlfriend, Eveonne

Webster, and many more too numerous to name. To my fellow classmates, I say: Good luck and much success in the future. WE HAVE MADE IT AT LAST.

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CHAPTER ONE

EXECUTIVE SUMMARY

The Purpose of This Project

The purpose of this project is to document an operational plan for the development of a strategic marketing plan for XYZ Corporation, and analyze the alternative fuel bus market in the United States. The XYZ Corporation was established in 1957. XYZ Corporation is a Taiwan-based company concentrating on natural gas industry and manufacturing of automotive parts-especially for heavy-duty vehicles such as buses.

Company Background and Introduction

The XYZ Corporation is planning to enter the United States market within the next five years in order to expand overseas and to become a global company. The XYZ Corporation will be in the forefront of creating the alternative fuel bus in the next five years. The XYZ Corporation will start with a clean sheet of paper from the ground up and will develop environmentally friendly, hybrid, electric buses for the United States market. The major objective is to provide bus riders and transit owner/operators with a low emission cost effective

replacement. This would be an alternative to the noisy, polluting, and diesel powered buses.

Market Analysis

There are market demands world wide for environmentally friendly transportation, which has led to the current hybrid-electric vehicle solution. The XYZ bus is a hybrid design in that it has two sources of power: storage batteries; and an onboard auxiliary power unit (APU) keeps the batteries charged on route.

Marketing and Sales Activities

The mission of XYZ Corporation is to provide hybrid-buses that are profitable, and are an alternative to the use of fuel for the purpose of environmental protection (being gasoline or diesel.) These transit buses will replace thousands of existing, noisy, polluting diesel buses in the global market. The rapidly growing opportunity to provide alternative fuel vehicles domestically and in foreign nations is driven primarily by environmental concerns and political responses. These actions have resulted in the enactment of widespread clean air legislations, not only notably in California, but also in foreign areas such as New Delhi, India, Honk Kong, and China, where strict rulings are being enacted against the

further use of diesel-fueled vehicles. In addition to XYZ produced buses, XYZ Corporation will provide, as an Original Equipment Manufacturer (OEM), its alternative fuel APUs for use in other manufacturer's buses, for on-board charging of bus batteries en route.

Product and Service Research and Development

In regard to market strategy, for meeting the global clean-air demand opportunities, XYZ Corporation has been pre-conditioning and pre-selling its models for the past several years in the Asian and European markets. XYZ has received a great interest from the customers and bus manufacturers worldwide. XYZ Corporation's main marketing strategy is to license its turnkey factories and service centers for locally operated manufacturing and after sale support of its buses in the domestic and foreign markets.

Primary target markets for XYZ business are domestic transit (within city) private owner/operators and government transit agencies such as the New York Transit Authority, Los Angeles Metropolitan Transit Authority and many school districts. Secondary target markets for the XYZ buses and APUs are foreign transit owner/operators, bus manufacturers, which may be either privately or government controlled.

Financial Data

The financial requirements to enter the market consist of two steps. The first step is the pre-production building, testing, and evaluation and demonstration phase for XYZ model electric bus and for the APU. The first step requires $8,500,000 of investment and second step requires $50,000,000 for manufacturing facility and marketing efforts.

CHAPTER TWO

MARKET ANALYSIS

Industry Description and Outlook

Description of the Primary Industry

The Truck and Bus Body Industry (SIC 3241) is defined as establishments primarily engaged in manufacturing truck, van and bus bodies, hydraulic hoists and tailgate loaders. Commercial trailers are a secondary product of this industry. Establishments primarily engaged in manufacturing commercial trailers are classified in Commercial Trailer Industry (SIC 3242). Some, but not all of the products related to this industry include:

- Bus bodies;
- Delivery truck bodies;
- Dump truck bodies;
- Hydraulic hoists and tailgate loaders;
- Stake truck bodies;
- Tank truck bodies;
- Truck and bus body assembling and chassis mounting;
- Utility and service truck bodies (including tire and tow truck); and
- Cube van bodies.

According to Industry Canada, demand for components and assemblies in this industry should remain stable. However, companies that target particular niches such as small buses will outperform the overall market. Other sectors will continue to face over-capacity and intense competition.

Manufacturers throughout the industry are increasing the use of such innovations as computer-assisted design and manufacturing (CAD), robotics, automated punch presses and shearing systems. Technological advancements have made it possible for the trailer industry to produce lighter-weight trailers. An important issue is designing trailers with optimum usable cube space. One major trend in the trailer market is the integration of all undercarriage components. This approach allows manufacturers to concentrate on building bigger, more damage-resistant boxes.

The transportation industry is undergoing exciting new developments in electric, natural gas, propane, and hybrid vehicles. Long and short-term goals of energy efficiency and clean air have created a market opportunity for Northeast technology and manufacturing industries. A growing number of businesses in the Northeast are already involved in developing these technologies and

manufacturing components for alternative vehicles with target markets both here and abroad.

The bus and coach industry is changing fast. Recent years have seen large numbers of takeovers, joint ventures and cooperation agreements between companies to cope with the need to reduce costs and remain competitive. There has also been a major shift towards new markets. China is now the biggest global producer and user of buses. In the longer term, although it is not there yet, India, with its burgeoning population, is poised to become the number two biggest market in the world. Such countries, however, are relying heavily on technology from the Western world, Europe in particular, and future growth must rely heavily on current and future cooperative deals.

The transit bus industry fills the needs of an essential niche market in the overall transportation industry. The transportation industry recognizes that use of standard diesel engines for motive power will change to more favorable alternative fuels and as cleaner burning vehicles become more available, there will be a greater number of alternative fuel transit busses purchased, especially for the inner city routes and school buses. As populations increase globally, clean, economic, practical mobility become more urgent.

Size of the Industry

There are over 60,000 buses operating in the United States with most of these being diesel powered. However, in the last several years there has been a steady increase in the purchase of the number of alternative fuel buses, including hybrid electrics. This information was obtained from the Electric Vehicle Transit Institute (ETVI) in Chattanooga, Tennessee, non-profit transportation industry and from data provided by the American Public Transit Association (APTA).

According to American Public Transportation (APTA) information, over 3,000 new buses of between 40 feet and 45 feet overall length are sold in the United States each year. These buses are predominantly in city buses operated on diesel fuel. Trends now are for the industry to shift to meet the market demand for alternative fuels. However, most bus companies resist this shift except when driven by mandates for alternative fuel compliance vehicles. Established bus builders have been making profit for years by selling diesel-fueled buses and resist changing the product features due to high costs of research and development.

Tables 1 and 2 below give brief information regarding to the size of the truck and bus manufacturing industry and investments.

Table 1. Industrial Statistics Truck and Bus Body Industry Canada and the United States, 1992-2000

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada									
Manufacturing Shipments	0.5	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.8
Total Costs	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.4	0.4
Material Costs	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.4	0.4
Fuel & Electricity Costs *in millions of dollars	5.0	5.0	6.0	6.2	6.2	6.3	6.6	7.4	7.8
Manufacturing Value Added	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
Employment	3952	3543	4447	4407	4840	5154	5582	6827	6706
United States									
Manufacturing Shipments	6.0	5.1	6.7	9.8	12.8	14.7	15.8	16.4	17.3
Total Costs	3.0	3.3	3.5	4.6	5.2	5.6	6.5	5.9	6.5
Material Costs	3.0	3.2	3.4	4.5	5.2	5.5	6.5	5.8	6.5
Fuel & Electricity Costs *in millions of dollars	46.0	45.1	60.0	59.6	71.2	82.6	68.4	72.1	77.0
Manufacturing Value Added	2.1	1.8	2.2	3.0	4.3	5.2	5.1	6.0	6.9
Employment	37200	31100	35900	34900	36500	40000	37300	37440	37474

(Billions of Canadian Dollars)
Source: Statistics Canada, Industry Canada and the U. S. Department of Commerce

Table 2. Capital Stock Truck and Bus Body Industry Canada and the United States, 1992-2000

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada									
Equipment	10.5	16.4	13.7	15.0	20.5	21.6	20.0	30.4	24.4
Construction	2.7	2.1	1.1	1.4	2.7	2.9	6.2	5.7	2.7
Sub-total	13.2	18.5	14.8	16.5	23.2	24.4	26.2	36.1	27.0
Labour	155.1	173.2	182.9	224.2	238.1	148.2	160.2	135.9	84.1
United States									
Equipment	65.8	48.2	73.4	81.9	212.4	160.4	124.9	135.8	147.6
Construction	19.3	28.0	15.6	26.4	26.9	64.9	56.4	62.5	69.1
Sub-total	85.1	76.2	89.0	108.4	239.3	225.3	181.3	198.3	216.7
Labour	979.2	823.9	1049.9	1140.1	1326.6	1490.4	1439.0	1439.0	1439.0

(Millions of Canadian Dollars)
Source: Statistics Canada, Industry Canada and the U. S. Department of Commerce

Industry Characteristics and Trends

Manufacturers are pursuing a variety of strategies to market alternative fuel vehicles to fleet buyers. These include the production of flyers and brochures targeted at specific areas of the fleet market, the production of Internet websites designed to highlight each manufacturer's alternative fuel offerings, and participation in various programs such as the DOE Clean Cities Program. Manufacturers are also participating in the DOE Clean Cities Program's advancing the AFV Choice marketing seminars being held in Clean Cities across the nation. Manufacturers are also placing advertisements for

their alternative fuel vehicle offerings in fleet publications.

To heighten awareness of alternative fuel vehicles among the general public, manufacturers are also cooperating in the production of educational materials for use in schools. They are also providing sponsorship of activities such as Future Truck and the Tour de Sol. A number of incentives are available to reduce incremental costs of alternative fuel vehicles for the United States purchasers, both from the Federal government and from state governments. The Federal government offers a tax deduction of $2,000 to $50,000 (dependent on vehicle size) for the purchase or conversion of qualified alternative fuel vehicles, and a credit is available for ten percent of the purchase price of an electric vehicle, up to $4,000. Thirty-five states offer some sort of alternative fuel vehicle incentive, including Arizona, which offers incentives that include a 95 percent reduction of license taxes, a $7,500 state income tax credit for light-duty vehicles, and no state taxes on alternative fuels. Legislation under consideration in the Congress would significantly expand incentives for alternative fuels, alternative fuel vehicles, fuel cell vehicles, and hybrid

vehicles, without negatively impacting the highway trust fund.

Infrastructure considerations are a major influence on alternative fuel vehicle sales. Availability of the infrastructure in a given area for a given fuel will dictate whether or not vehicles using that fuel will be popular (or even available) in that area. Also, the availability of infrastructure itself can vary from region to region depending on the availability of the alternative fuel. For example, propane vehicles are popular in rural areas, because of propane's availability in rural areas as a home heating fuel. Propane is especially popular as a motor fuel in Texas, because of that state's abundant natural supply of the fuel. Natural gas vehicles can be found throughout the United States, since the country has an extensive natural gas pipeline system providing the fuel to most areas.

While ethanol vehicles are sold throughout the country, ethanol vehicle infrastructure is centered in the corn-producing states in the Midwest. In some cases, alternative fuel vehicle sales can dictate the construction of infrastructure. Electric vehicles are offered predominantly in California and Arizona due to the favorable climate in those states.

Major Customer Groups

The customers of bus manufacturers consist of two segments. The government agencies are the largest segment of customer groups and private sector is the second largest buyers.

We can summarize the first group of bus buyers (government agencies) with the following statements;

- School districts (school buses)
- Intercity government bus operators (intercity buses)
- National Parks (shuttle buses)
- Airports (shuttle buses)

The second group of customers, owned and operated by the private sector, can be summarized with the following statements;

- Small companies: About 19 of the companies in the intercity bus industry are small companies operating fewer than 25 buses.
- Mid-sized companies: The middle part of the bus industry consists of about 320 companies that operate between 25 and 99 buses each. These companies run about 14,000 buses or almost

one-third (31 percent) of the fleet and account for about one-third of the industry mileage.

- Large companies: About 50 large companies operate more than 100 buses each. These companies operate about 11,000 buses or about one-fourth (25 percent) of the fleet and drive 30 percent of the total industry mileage.

Table 3 provides information regarding to private companies, as potentially customers of the bus manufacturers.

Table 3. Numbers of Carriers Providing Information Grouped by Fleet Size

Numbers of Carriers Providing Information Grouped by Fleet Size

Fleet Size	<10	10-24	25-49	50-99	100+	TOTALS
Total Reporting	1,366	455	137	83	41	2,082
Services	1,121	386	102	59	25	1,693
Charter	1,069	380	97	56	21	1,623
Tour	347	150	41	14	6	558
Sightseeing	265	94	29	18	8	414
Scheduled	83	56	32	23	9	203
Airport	208	68	26	12	8	322
Contract Commuter	179	63	20	15	6	283
Private Commuter	20	12	5	4	3	44
All Other	63	36	8	5	5	117

Source: American Bus Association, Motor coach Census, 2000

Target Markets and Customer Analysis
Applications by Market Segment

Intercity - "The intercity market segment is defined as public or private, non-local travel between cities, or a bus for hire to a specific destination."

Charter/Tour - a bus for hire to a specific destination

Line Haul - non-local city-to-city scheduled service

Motorhomes/Entertainer Coaches - private city-to-city travel

Government/Other - private government city-to-city operations; public transit applications.

Transit - "The transit market segment is defined as general public transportation, regionally local service, either scheduled, fixed route service or demand response."

Urban Transit - scheduled, fixed route intra-city service

Commuter Transit - fixed route commuter service

Demand Response - service on request, non-fixed route, non-scheduled

Small/Mid-Size (Shuttle) - "The shuttle market segment is defined as public or private, regionally local service, fixed or non-fixed route, scheduled or non-scheduled."

Public - It includes commuter transit and demand response as defined above

Private Airport Shuttle - back and forth service between particular location(s) and airport

Rental Car - private back and forth service between rental car agency and various destinations, predominantly airports

Hotel/Resort - private back and forth service between hotel/resort and various destinations, predominantly airports and/or local attractions

Senior Living - private service specifically for residents of senior facilities Corporate - private service specifically for employees of a particular corporation

Other - this includes universities, churches, tourist attractions, etc.

School Bus - "The school bus market segment is defined as transportation of pupils to and from school or school-related activities."

District Operated - equipment owned and operated by a particular school or district

Private Contractor - equipment owned and operated by a third party and contracted by the school or district

Other - this includes some charter, government, universities and churches, etc.

The school bus industry is fragmented and mature. Nationwide, approximately 418,000 yellow school buses provide daily transportation to approximately 24 million elementary and secondary school students. The school transportation system is considered the single largest system of public transportation in the country. State governments, municipalities and local school districts regulate school bus operations. Approximately 1/3 of these buses are owned by private contractors, with the remaining 2/3 owned by local school boards.

Distinguishing Characteristics of the Primary Target Markets

The largest buyer of the alternative fuel buses is government agencies. The most distinguishing characteristics of the primary customers are issues related with the cost of operating the vehicles and quality. The geographic location of the primary targets cannot be distinguished, but their choice among the alternative fuel vehicle types can be identified such as natural gas or electrical vehicles. Especially, the government agencies are pursuing a strategy to encourage the use of the alternative fuel buses and shuttles. The

main concerns of the primary targets can be stated with the following issues:

1. Legislative and regulatory requirements
2. Fuel availability and price
3. Health, pollution and safety considerations
4. Operating cost of alternative fuel buses
5. Lifecycle of buses
6. Availability of technical training for maintenance
7. Service and warranty
8. Tax incentives

Critical Needs

The most important need in alternative fuel bus manufacturing is decreasing the cost and price of the buses. The alternative fuel vehicles are relatively more expensive than gasoline and diesel vehicles. In many cases, operating costs of the alternative fuel buses exceed the operating costs of the gasoline and diesel buses

Market development is all about using limited resources effectively. It means understanding what your coalitions and stakeholders need to be doing, and in what order those things should be done to make AFV purchase decisions for their fleets easier. Market development is

really a systematic process for identifying dominant obstacles for expanded AFV use, customizing programs to address these obstacles in a manner sensitive to the political realities of the region, and then mobilizing (and in some cases, streamlining) the coalition so it is equipped to get the job done. Marketing and information dissemination are also key; however, using resources effectively means first being clear about those fleets that are the best candidates for AFVs, and then targeting information and sales at the most promising fleets.

Geographical Locations

The use of the alternative fuel buses is mostly common in North America: 60 percent of all these buses sold in the United States. The dominant types of alternative fuel buses change according to fuel infrastructure in that particular state or region

Purchase Decision Makers

Sixty-five transit agencies in the United States now operate alternative fuel buses and even more have them in their purchase plans. There is no distinction between the buyers of alternative fuel buses and gasoline/diesel bus buyers.

Most of the contacts in the industry will not be with the owner of the business. Even though some of the

companies are privately owned, the owner may not be involved in making decisions. In a small bus company, limo service or charter air service, the owner may be the decision maker. The biggest customer of the alternative fuel buses is government agencies such as airports, school districts, and private companies that provide services to those agencies. In the decision-making mechanism of these agencies, changes occur according to the dollar amount of purchases and the type of the agency. These agencies generally offer bids to manufacturers directly. According to service, price, and other criteria determined, the purchase committee evaluates the offers. Tables 4 through 5 provide information regarding the name of the potential customers of the alternative fuel buses.

Table 4. The Name of Potential Companies of the Alternative Fuel Buses

RANK	COMPANY	Fleet 2002	Fleet 2001	Loss/ Gain	Small Buses	Small Buses with Lifts	Large Buses	Large Buses with Lifts	District Contracts	Students Transported
1	Laidlaw Education Services Naperville, Ill.	42,790	40,588	+2,202	14,039	1,965	28,751	1,725	1,161	2,400,000
2	First Student Inc. Cincinnati	15,000	14,853	+147	1,500	500	13,500	250	500	1,000,000
3	National Express Corp. Austin, Texas	8,649	8,500	+149	23,460	1,729	5,189	432	258	270,000
4	Atlantic Express Corp. Staten Island, N.Y.	6,998	6,986	+12	2,630	668	4,368	298	200	321,000
5	Stock Transportation Aurora, Ontario	2,210	2,209	+1	1,225	259	985	26	28	94,000
6	Student Transportation of America Inc. Howell, N.J.	2,163	1,400	+763	n/a	n/a	n/a	n/a	60	150,000
7	Cardinal Coach Lines Calgary, Alberta	1,450	1,450	0	n/a	n/a	n/a	n/a	n/a	n/a
8	Cook-Illinois Corp. Oak Forest, Ill.	1,200	1,200	0	450	n/a	750	n/a	n/a	n/a
9	Baumann and Sons Bohemia, N.Y.	1,030	1,030	0	730	10	300	0	14	40,000
10	WE Transport Inc. Plainview, N.Y.	927	927	0	732	113	195	6	n/a	n/a
11	The Trans Group Chestnut Ridge, N.Y.	885	910	-25	464	75	421	6	26	62,000
12	Suffolk Transportation Service Bay Shore, N.Y.	800	810	-10	450	50	300	0	n/a	25,000
13	A&E Transport Services Inc. Oswego, N.Y.	785	785	0	670	120	115	54	44	30,000
14	Septran Inc. Bloomington, Minn.	773	740	+33	650	74	49	0	54	23,800
15	Krapf Bus Companies Exton, Pa.	720	720	0	120	30	600	2	8	40,000
16	DATTCO Inc. Barrington, Conn.	688	900	-212	152	18	515	3	13	65,000
17	Murphy Bus Service Middletown, N.J.	550	n/a	n/a	155	40	395	0	n/a	80,000
18	Mid Columbia Bus Co. Inc. Pendleton, Ore.	527	513	+14	92	32	435	12	26	14,016
19	Petermann LLC Cincinnati	525	255	+270	35	n/a	490	n/a	n/a	40,000
20	Briggs Bus Lines Edmonton, Alberta	513	513	0	96	22	417	23	9	17,000
21	Birnie Bus Service Rome, N.Y.	488	480	+8	200	18	279	41	12	20,000
22	Northstar Passenger Services Ltd. Barrie, Ontario	470	320	+150	134	47	336	n/a	15	20,000
23	Groupe-Gaudreault Inc. Repentigny, Quebec	430	430	0	70	15	360	4	n/a	33,000
24	Johnson School Bus Service Inc. West Bend, Wis.	405	n/a	n/a	127	36	278	2	14	20,312
25	W.L. Roenigk Inc. Sarver, Pa.	401	253	+148	208	30	193	2	15	n/a

Source: http://www.schoolbusfleet.com/Stats/pdf/stats_1201_top100.pdf

Table 5. The Name of Potential School Districts of the Alternative Fuel Buses

RANK	SCHOOL DISTRICT	Route Buses 2001	Route Buses 2000	Change 2000 vs. 2001	Small Buses	Small Buses with Lifts	Large Buses	Large Buses with Lifts	Total Buses	Contractor Buses	Students Transported (Daily)
1	New York City Public Schools Long Island, N.Y.	5,500	n/a	n/a	2,368	401	3,132	330	5,500	5,500	186,350
2	Chicago Public Schools Chicago	2,530	2,050	+480	514	146	2,016	249	2,530	2,530	42,000
3	Los Angeles Unified School District Los Angeles	2,220	2,753	-533	260	96	1,054	0	2,670	1,353*	70,000
4	Miami-Dade County Public Schools Miami	1,512	1,448	+64	76	20	1,862	402	1,938	230	71,700
5	Montgomery County Public Schools Rockville, Md.	1,131	1,010	+121	0	0	1,151	168	1,151	0	96,000
6	Prince George's County Public Schools Upper Marlboro, Md.	1,128	1,097	+31	96	96	1,170	0	1,266	11	96,421
7	Broward County Schools Oakland Park, Fla.	1,105	1,079	+26	100	40	1,200	200	1,300	1,300	70,000
8	Fairfax County Public Schools Lorton, Va.	1,093	1,194	-101	0	0	1,460	262	1,460	0	117,862
9	Milwaukee Public Schools Milwaukee	1,086	1,650	-564	267	32	819	5	1,086	1,086	48,400
10	Jefferson County Public Schools Louisville, Ky.	1,080	835	+245	130	10	1,002	68	1,210	178	61,000
11	Hillsborough County Public Schools Thonotosassa, Fla.	1,067	1,067	0	62	21	1,249	175	1,311	0	86,187
12	Dallas County Schools Dallas	1,050	1,100	-50	493	6	832	57	1,325	0	45,000
13	Philadelphia School District Philadelphia	1,044	1,012	+32	105	15	359	172	1,113	649*	31,644
14	Gwinnett County Public Schools Lawrenceville, Ga.	1,042	928	+114	347	287	792	0	1,139	0	80,000
15	Charlotte-Mecklenburg Schools Charlotte, N.C.	1,015	997	+18	0	0	1,125	100	1,125	0	n/a
16	Orange County Public Schools Orlando, Fla.	1,000	1,000	0	3	3	1,300	205	1,303	0	70,000
17	DeKalb County Schools Tucker, Ga.	972	n/a	n/a	243	100	941	4	1,184	0	78,000
18	Clark County School District Las Vegas, Nev.	950	1,012	-62	438	139	627	160	1,065	0	102,830
19	Duval County Public Schools Jacksonville, Fla.	913	938	-25	0	0	1,260	226	1,260	1,260	55,000
20	Cobb County School District Marietta, Ga.	869	834	+35	0	0	869	70	999	0	73,000

*Not included in small/large bus breakdown or total buses

Source: http://www.schoolbusfleet.com/Stats/pdf/stats_1201_top100.pdf

Primary Market Size

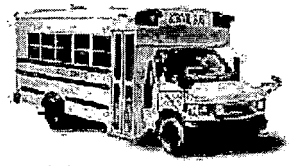
The bus manufacturing market is considered to be a mature market. The largest segment in bus manufacturing is school buses. Alternative fuel buses are not considered to be another market segment; rather alternative fuel buses are considered to be a product feature. The implementation of the alternative fuel buses is increasing but sales of alternative fuel buses are relatively low. In order to make a detail analysis of the bus market, it is better to break down each segment for deep understanding of the bus market.

1. School bus:

The school bus is the largest segment in bus manufacturing. The size of this market changes every year according to type of the school bus. There are four bus classifications: types A, B, C and D. More than 90 percent of school buses are type C or D.

Type A: Suburban-Type Vehicle. This type resembles a conventional suburban-type vehicle and has a common capacity of eight pupils and a driver. A Type "A" (formerly Type II) school bus is a conversion or body constructed upon a van-type compact truck or a front-section vehicle, and has a gross weight rating of ten thousand (10,000) pounds or less, designed for

carrying more than ten (10) persons. (Approximate capacity: 10-16)



Source: Bus types http://www.state.me.us/education/const/Buses/schoolbustypes.htm

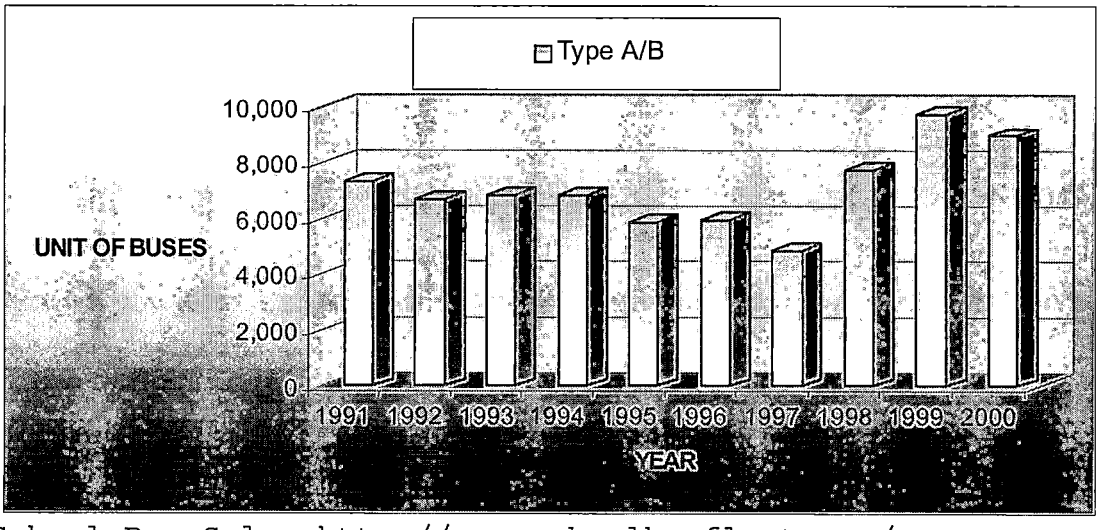
Figure 1. Type A School Bus

Type B: Standard Van or Chop-Van Chassis. With a weight rating of more than 10,000 lbs., this vehicle is constructed of a standard van or chop-chassis, with a body added by the school bus manufacturer. A Type "B" (new classification) school bus is a conversion or body constructed and installed upon a van or front section vehicle chassis or stripped chassis, designed for carrying more than ten (10) persons. Most of the engine is beneath and/or behind the windshield and beside the driver's seat. The entrance door is behind the front wheels. (Approximate capacity: 10-24)

Source: Bus types http://www.state.me.us/education/const/Buses/schoolbustypes.htm

Figure 2. Type B School Bus

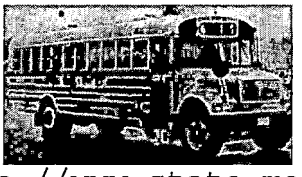
School bus sales have been generally steady since the 1990's. Moreover, in 1999 and 2000 the demand for type A and B was greatly increased. During the past years, the minimum units of sales were 5,854 in 1997. The following years the sales of the small size buses increased more than the large size buses. The demand of small size buses heavily depends on the regions where the school bus serves. Especially the schools, which serves large public areas for different locations prefer small size buses. Figure 3 provides information regarding to the sales of type A and B school buses.



School Bus Sales http://www.schoolbusfleet.com/ SBFFB01p34.pdf

Figure 3. The Sales of Type A and B School Buses, Year 1991-2000

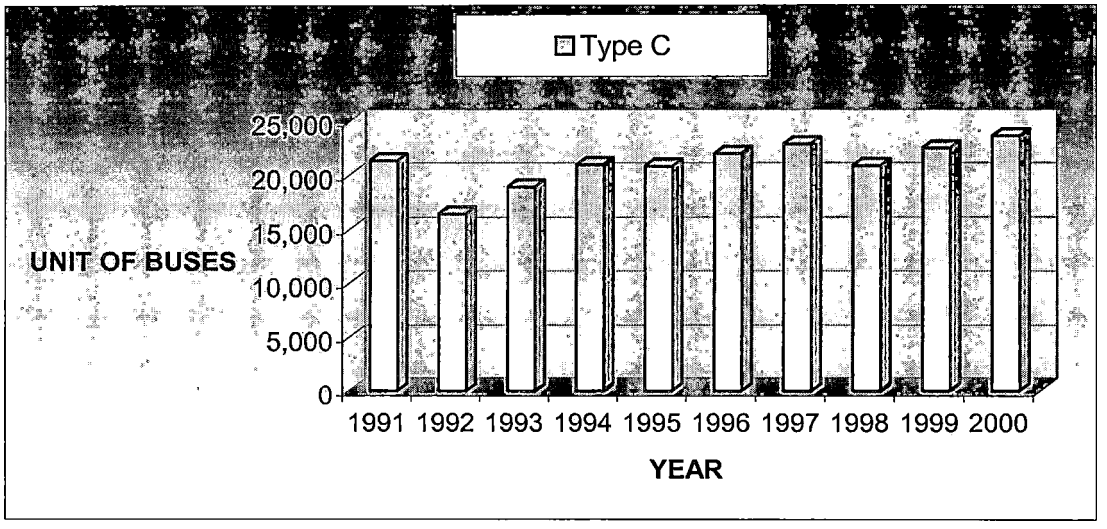
Type C: Conventional. This type is identifiable by the engine that protrudes at the front of the vehicle, ahead of the front windshield. It typically weighs 12-15 tons. The driver's seat and main student entrance door are located behind the front axle. A Type "C" (formerly Type I) school bus is a body installed upon a flat-cowl chassis and is designed for carrying more than ten (10) persons. The entire engine is in front of the windshield, and the entrance door is behind the front wheels. (Approximate capacity: 23-72)



Source: Bus types http://www.state.me.us/education/const/Buses/schoolbustypes.htm

Figure 4. Type C School Bus

The sales of type C school buses are the largest segment among the school buses. Sales of type C remain steady during the last five years. Every year, around 20,000 units of type C buses has been sold in the United States market. Type C bus has an average lifetime of 12 years. School districts prefer type C school buses due to long lifetime and low operating costs. The minimum unit sales between 1991 and 2000 were 16,440 in 1992. Figure 5



Source: School Bus Sales http://www.schoolbusfleet.com/SBFFB01p34.pdf

Figure 5. The Sales of Type C School Buses, Year 1991-2000

provides information regarding to the sales of type C school buses.

Type D: Flat-Nose. This is identifiable by a body that extends the full length of the chassis, giving it a characteristic "flat-nose" design. The driver's seat and primary entrance door are forward of the front wheels, with the engine located at either the front or rear of the vehicle. A Type "D" (formerly Type I) school bus is a body installed upon a chassis, with the engine mounted in the front, midship or rear, and has a gross vehicle rating of more than ten thousand (10,000) pounds, designed for carrying more than ten (10) persons. The engine may be behind the windshield and beside the driver's seat; it may

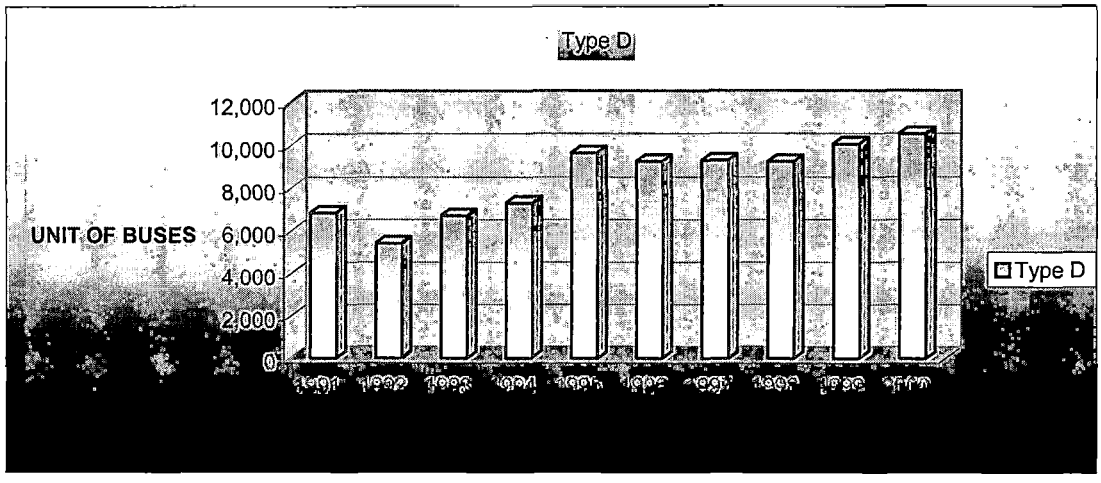
be at the rear of the bus, behind the rear wheels; or mid ship between front and rear axles. The entrance door is ahead of the front wheels. (Approximate capacity: 72 or over)

Source: Bus types http://www.state.me.us/education/const/Buses/schoolbustypes.htm

Figure 6. Type D School Bus

The sale of type D is the second largest segment among the school buses. The growth rate for this particular school bus between 1999 and 2000 is 4.60 percent. The sale of type D buses is not popular due to the operating costs and safety issues. When it comes to buy large size buses, type C buses have an advantage of crash effects. The front engine structure in type C buses is decreasing the effect of crashes and makes more popular for the sales. Figure 7 provides information regarding to the sales of type D school buses.

Sales of school buses between 1999 and 2000 were the highest on record and increasing two percent over 1999 figures. Softening of the small bus market (type A & B) was more than offset by an increased demand for large



School Bus Sales http://www.schoolbusfleet.com/ SBFFB01p34.pdf

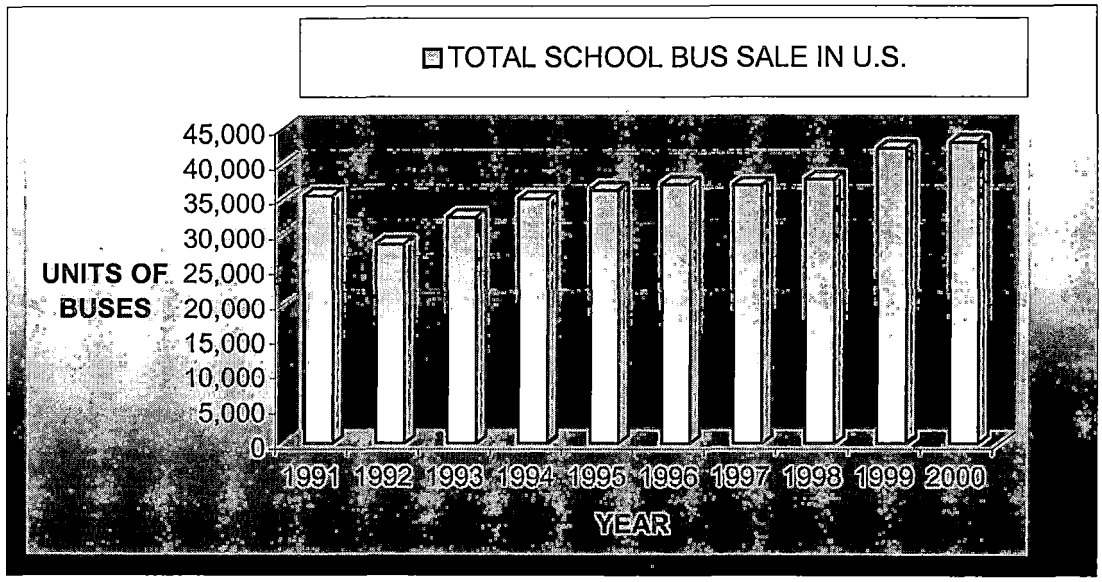
Figure 7. The Sales of Type D School Buses, Year 1991-2000

buses. In 2000, the sales of the Type A and Type B school buses decreased dramatically, it had a negative 7.90 growth rate if comparing with 1999.

Table 6. United States School Bus Sales (by type)

Sales Year	Type A/B	Type C	Type D	Total
1991	7,310	21,370	6,864	35,544
1992	6,676	16,444	5,444	28,564
1993	6,779	18,928	6,734	32,441
1994	6,779	21,005	7,321	35,105
1995	5,854	20,861	9,671	36,386
1996	5,948	22,016	9,270	37,234
1997	4,860	22,885	9,323	37,068
1998	7,760	20,913	9,264	37,937
1999	9,779	22,485	10,077	42,341
2000	9,007	23,630	10,545	43,182
Change 2000-1999	-7.90%	5.00%	4.60%	2.00%

Source: School Bus Sales http://www.schoolbusfleet.com/SBFFB01p34.pdf



School Bus Sales http://www.schoolbusfleet.com/SBFFB01p34.pdf

Figure 8. Total School Bus Sales in the United States

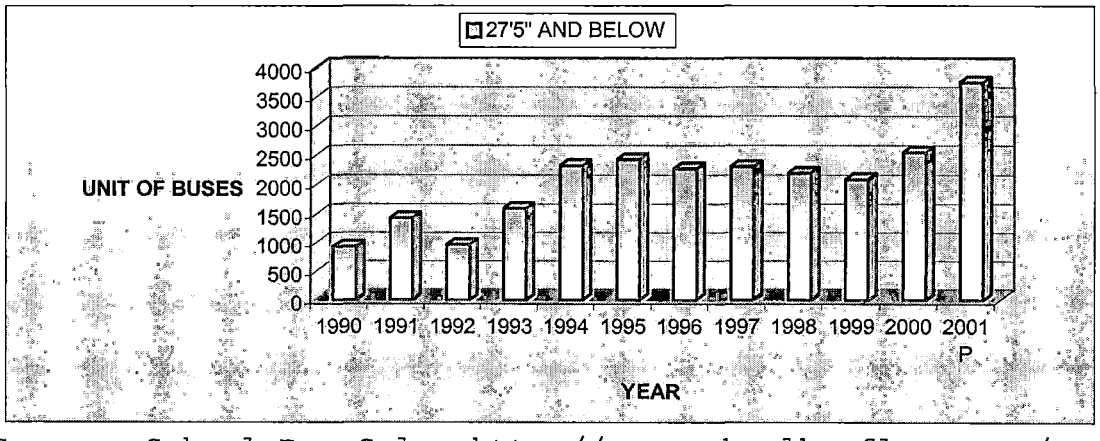
After a lengthy period of strong bus sales, the cycle has turned in another direction, with an 11. 80 percent decline seen in the 2001 sales year. In 2001, 38,099 buses were sold in the United States market. Another sales decline is expected for the 2002 sales year. The school bus market is mature and has the largest market share among the bus market.

2. Transit and Intercity buses:

This segment differs from the school buses in terms of customers and regulations such as safety issues. The market size is smaller than the school buses, but the growth rate and usage of alternative fuel systems is more popular than school buses in this segment. The types of

buses and market size of each type within the segment is divided according to the length of buses.

27'5" and below: The sale of small buses is the fastest growing segment. The small size buses compromises 35 percent of this segment. Between 2000 and 2001, sales of 27'5" length buses growth was 47 percent. The future expectations for 2002 for the small size bus sales will remain at the same level due to the economic recession in the United States. Small buses gained popularity especially in airports and in the tourism industry.



Source: School Bus Sales http://www.schoolbusfleet.com/SBFFB01p34.pdf

Figure 9. Small Buses Sales in the United States, Year 1990-2000

27'6" to 32'5" length: The middle size buses consists of 8.20 percent of this particular segment. The market size for the middle buses is small. Around 800 units of

middle size buses are sold in the United Sates. Market growth for this segment is around 11 percent between 2000 and 2001. The usage of this type is mostly in airports and shuttle services.

37'6" to 45'0" length: In 2001, more than 50 percent of the buses sold in the United Sates were big size buses. In terms of the market size and growth rate, big size buses are the cash cow of the bus manufacturers. Table 7

Table 7. Bus Sales in the United States

YEAR	27'5" AND BELOW	27'6" - 32'5"	32'6" - 37'5"	37'6" - 45'0"	ARTICULATED/ DOUBLE DECKED	TOTAL UNITS
1990	932	450	567	2,782	48	4,779
1991	1,430	395	357	2,460	80	4,722
1992	968	338	584	1,482	54	3,426
1993	1,594	333	374	2,435	100	4,836
1994	2,333	147	350	2,513	75	5,418
1995	2,436	420	358	2,695	113	6,022
1996	2,282	383	405	2,885	61	6,016
1997	2,316	603	641	2,591	178	6,329
1998	2,206	556	463	3,698	212	7,135
1999	2,100	770	387	3,240	318	6,815
2000	2,556	747	274	3,528	591	7,696
2001 Projected	3,756	873	418	5,502	148	10,697
2001 percent of Total	35.10%	8.20%	3.90%	51.40%	1.40%	100.00%

Source: American Public Transportation Association http://www.apta.com/stats/vehicles/newbuslg.htm

provides information regarding to the bus sales in the United States.

Sales of transit and intercity buses increased in 2000 and 2001 due to the replacements of diesel buses. The future expectations for the sales of the small buses will increase while the sale of big size buses will remain at the same level.

The Usage of Alternative Fuel Buses in United States Market

Although the benefits of alternative fuels, such as cleaner air and energy conservatism, are obvious, the bottom line is economics when it comes to fleet purchase decisions.

The places where Alternative fuel vehicles fit best need to overcome the usual barriers—limited refueling infrastructure, cost, and range; and be economical for fleet owners. High-mileage, centrally fueled fleets are a good example of an appropriate niche for AFVs. High-mileage fleets consume large quantities of fuel, so over time, fleet managers enjoy the cost savings associated with less expensive alternative fuels. Low-mileage, high-use vehicles—those that must often wait, idling, or those with repeated starts and stops, such as airplane tugs and airline baggage carts—are another niche

market. Predictable routes and centralized refueling stations also facilitate scheduling and allow for overnight or off-hour refueling, leaving more time for scheduled stops during the workday. Considering these factors, alternative fuels in many applications can make both sense and cents. With the many niche markets in communities across the country—shuttle service and transit bus fleets, airport ground fleets, school bus fleets, and national park vehicles—market penetration for alternative fuels and vehicles can make a big difference. The share of alternative fuel powered buses is still low and limited, but growing at a high rate.

The usage of alternative fuel powered school buses has been increasing since 1996. In 1996, among the school buses, 887 of them used alternative fuel systems. The sales of alternative fuel powered school buses are still low due to the technical problems and the operating costs.

Table 8 provides information regarding to the use of alternative fuel systems among school buses.

Table 8. Number of Onroad Alternative-Fueled School Buses Made Available, by Fuel Type, 1995-1998

	1995	1996	1997	1998
Propane	134	493	120	66
Compressed Natural Gas (CNG)	205	383	160	181
Liquefied Natural Gas (LNG)	0	0	1	0
Electricity	1	11	3	0
Total	340	887	284	247

Source: Energy Information Administration, Form EIA- 886, "Alternative Transportation Fuels and Alternative Fueled Vehicles Annual Survey."

Propane and Compressed Natural Gas (CNG) are the most popular uses of alternative fuel systems among school buses. The use of alternative fuel buses is enforced by the regulations such as clean air acts.

A number of opportunities to develop innovative technologies present themselves for the future, particularly with respect to the development of environmentally sustainable technologies. Table 9 provides information regarding to the use of alternative fuel systems for the buses.

Table 9. Number of Onroad Alternative-Fueled Buses Made Available, by Vehicle Type and Fuel Type, 1997-2000

	1997	1998	1999	2000
School Bus	284	247	266	234
Liquefied Petroleum Gas (LPG)	120	66	59	84
Compressed Natural Gas (CNG)	160	181	207	148
Liquefied Natural Gas (LNG)	1	0	0	0
Electricity	3	0	0	2
Transit Bus	988	1,269	1,050	1,432
Liquefied Petroleum Gas (LPG)	67	153	133	101
Compressed Natural Gas (CNG)	879	690	823	973
Liquefied Natural Gas (LNG)	17	378	37	343
Electricity	25	48	57	15
Intercity Bus	28	4	59	79
Liquefied Petroleum Gas (LPG)	21	4	4	0
Compressed Natural Gas (CNG)	0	0	55	79
Liquefied Natural Gas (LNG)	6	0	0	0
Electricity	1	0	0	0
Total Buses	1,300	1,520	1,375	1,745

Source: Energy Information Administration, Form EIA- 886, "Alternative Transportation Fuels and Alternative Fueled Vehicles Annual Survey."

The use of alternative fuel buses increased in 2000, especially compressed natural gas for transit buses and school buses are the most visible usage of the alternative fuel options. Table 10 provides information according to usage of alternative fuel options in 2001.

Table 10. Number of Onroad Alternative-Fueled Vehicles Planned to be Made Available, by Vehicle Type and Fuel Type, 2001

Fuel Type	Buses
Liquefied Petroleum Gas (LPG)	122
Compressed Natural Gas (CNG)	2,162
Liquefied Natural Gas (LNG)	345
Ethanol, 85 Percent [b] (E85)	0
Electricity [c]	248
Total	2,877

Source: Energy Information Administration, Form EIA- 886, "Alternative Transportation Fuels and Alternative Fueled Vehicles Annual Survey."

As a conclusion, the bus market is in the maturity stage but the use of alternative fuel systems will increase. There are over 700,000 buses in the United States. Every year thousands of these buses will be replaced with clean technology. Table 11 provides the estimated operating bus units in the United States.

Table 11. The Breakdown of Operating Buses in the United States Based on Market Segment

Market Segment	Estimated Unites in Operation
Intercity/Coaches	45,500
Transit	91,300
Mini & Mid-Size	62,300
School Bus	537,600
Total	736,700

Source: http://www.busbook.com/tour/16.htm

truck manufacturing. The pay back period for the bus industry is relatively low comparing to the other industries due to the high initial capital investment.

Profitability in the Industry

Profitability in the bus industry is low due to outdated manufacturing techniques and high labor costs in the United States. The suppliers and bargaining power of the customers in many situations affect the financial performances of the manufacturers. The industry averages for bus manufacturing is stated under the name of bus and truck manufacturing. The pay back period for the bus industry is relatively low comparing to the other industries due to the high initial capital investment.

The gross margin for the industry is 19.69 percent in 2001, and the average gross margin of the past five years is 27.91percent. The net profit margin for the past five years is 4.52 percent. Although the profit margin is low

in the industry, the XYZ Corporation is expecting higher profit margins due to high-tech manufacturing technologies and lower labor costs. The average net profit margin for the bus-manufacturing sector is 4.52 percent during the last five years. Table 12 provides information regarding the financial ratios in the industry.

Market Penetration (Market Share, Number of Customers, Geographic Coverage)

XYZ Corporation is considering different levels of market penetration for each segment according to the number of competitors, market growth, and market size. The focus of the XYZ Corporation will be the United States alternative fuel bus market. Future markets for the developed XYZ model buses and turnkey manufacturing factories are in the United States, most notably in North America. Managerial operations including financial and marketing operations will be managed from the headquarters located in North America. In the first two years the focus will be the large size school buses. The turnkey facility will be located in Midwest to produce intercity and transit buses after the second year.

Table 12. The Financial Ratios in Bus Industry

Management Effectiveness (%)	Industry	Sector	S&P 500	Efficiency	Industry	Sector	S&P 500
Return On Assets (TTM)	0.46	3.86	5.85	Revenue/Employee (TTM)	437,548	317,203	641,491
Return On Assets - 5 Yr. Avg.	2.65	5.92	7.9	Net Income/Employee (TTM)	8,003	14,245	77,282
Return On Investment (TTM)	0.8	5.54	9.52	Receivable Turnover (TTM)	2.05	5.29	9.49
Return On Investment - 5 Yr. Avg.	4.54	8.65	12.69	Inventory Turnover (TTM)	12.48	8.99	10.29
Return On Equity (TTM)	-8.22	3.97	16.98	Asset Turnover (TTM)	0.68	1.1	NA
Profitability Ratios (%)	Industry	Sector	S&P 500	Growth Rates(%)	Industry	Sector	S&P 500
Gross Margin (TTM)	16.25	26.02	46.63	Sales (MRQ) vs Qtr. 1 Yr. Ago	2.44	3.5	-1.21
Gross Margin - 5 Yr. Avg.	19.69	27.91	47.4	Sales (TTM) vs TTM 1 Yr. Ago	-2.75	0.36	1.26
EBITD Margin (TTM)	6.81	9.47	20.53	Sales - 5 Yr. Growth Rate	5.15	8	12.12
EBITD - 5 Yr. Avg.	11.5	12.05	21.91	EPS (MRQ) vs Qtr. 1 Yr. Ago	8.53	12.9	7.71
Operating Margin (TTM)	-0.19	4.7	17.12	EPS (TTM) vs TTM 1 Yr. Ago	-52.15	-20.7	-4.3
Operating Margin - 5 Yr. Avg.	3.82	7.14	18.24	EPS - 5 Yr. Growth Rate	-16.29	-1.53	8.3
Pre-Tax Margin (TTM)	0.28	4.04	14.23	Capital Spending - 5 Yr. Growth Rate	7.15	1.42	10.57
Pre-Tax Margin - 5 Yr. Avg.	4.5	7.07	17.21	Dividends	Industry	Sector	S&P 500
Net Profit Margin (TTM)	0.35	2.6	9.88	Dividend Yield	2.46	2.08	1.97
Net Profit Margin - 5 Yr. Avg.	3.28	4.52	11.31	Dividend Yield - 5 Year Avg.	4.52	2.32	1.34
Effective Tax Rate (TTM)	28.45	34.72	33.68	Dividend 5 Year Growth Rate	13.93	6.97	7.98
Effective Tax Rate - 5 Yr. Avg.	35.92	36.48	35.78	Payout Ratio (TTM)	51.38	28.72	30.29

Source: multex investor- financial ratios bus&truck manufacturing http://www.multexinvestor.com/mgi/Mg.asp?target=/stocks/companyinformation/ratio&Ticker=coll

The sale of type C and D school buses is the main focus of the XYZ Corporation. In order to achieve the targeted market penetration, the sales force and distribution channels will be acquired according to the needs of school districts and private contractors. Figure 10 and Table 13 provide sales forecasts for the XYZ bus sales.

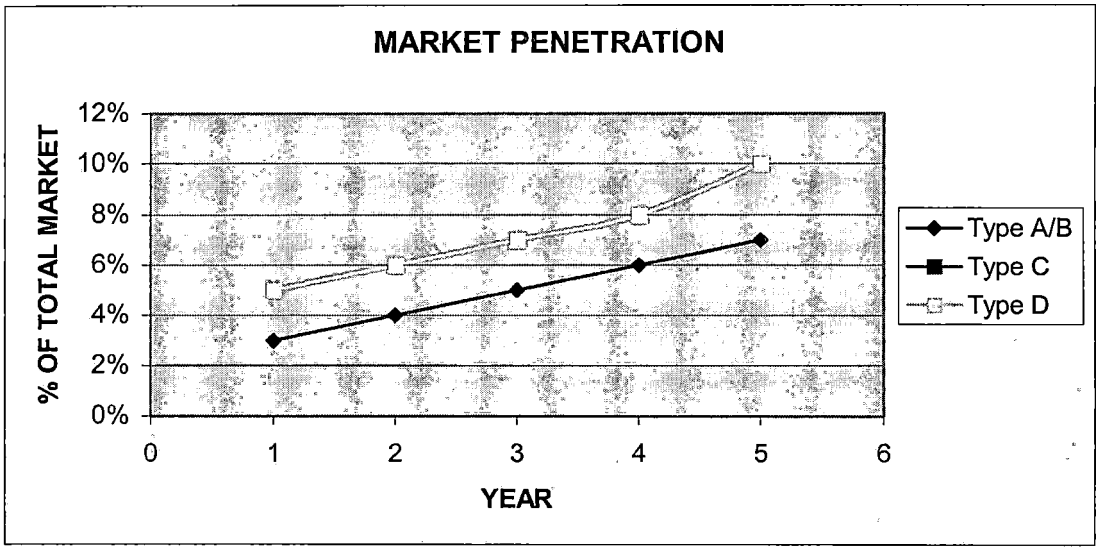


Figure 10. Targeted Market Penetration Graphic Form, Year 1-5

Table 13. Target Market Penetration by Percentage, Year 1-5

Bus type	Type A/B	Type C	Type D
Expected Market Size = Average of last five years market size	7,471	22,386	9,696
YEAR 1	3%	5%	5%
YEAR 2	4%	6%	6%
YEAR 3	5%	7%	7%
YEAR 4	6%	8%	8%
YEAR 5	7%	10%	10%

Targeted market penetration: Assumption for the market size is based on trends for the school bus sales, economic factors and environmental situations will be similar to last five years.

The XYZ Corporation will not sell the Auxiliary Power System and engine for the first three years in order to gain a strategic advantage and control market penetration level against the competition.

Table 14. Targeted Market Penetration Based on School Bus Type, Year 1-5.

Target Size of Sales	Type A/B	Type C	Type D
Unit of Buses			
Year 1	224	1119	485
Year 2	299	1343	582
Year 3	374	1567	679
Year 4	448	1791	776
Year 5	523	2239	970

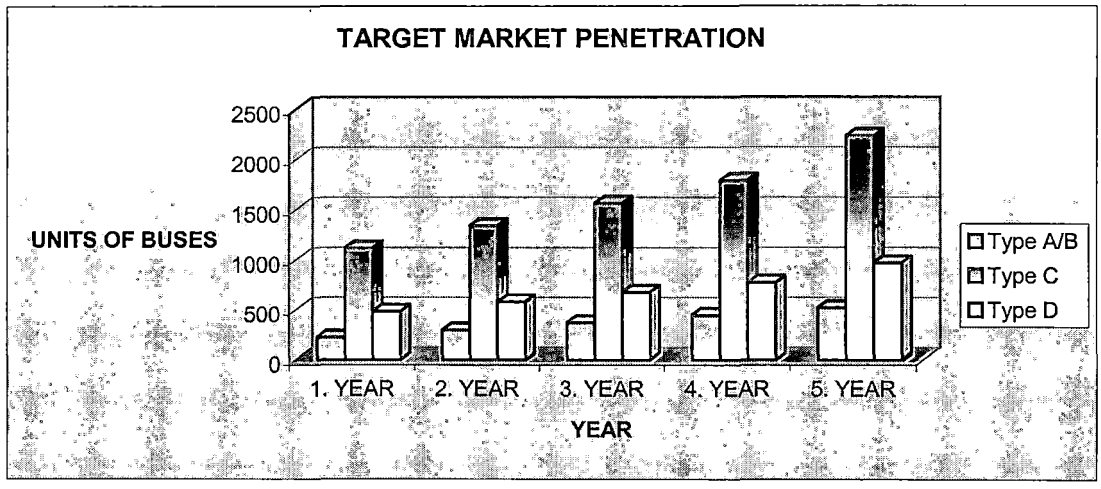


Figure 11. Targeted Market Penetration Graphic Form by Bus Type, Year 1-5

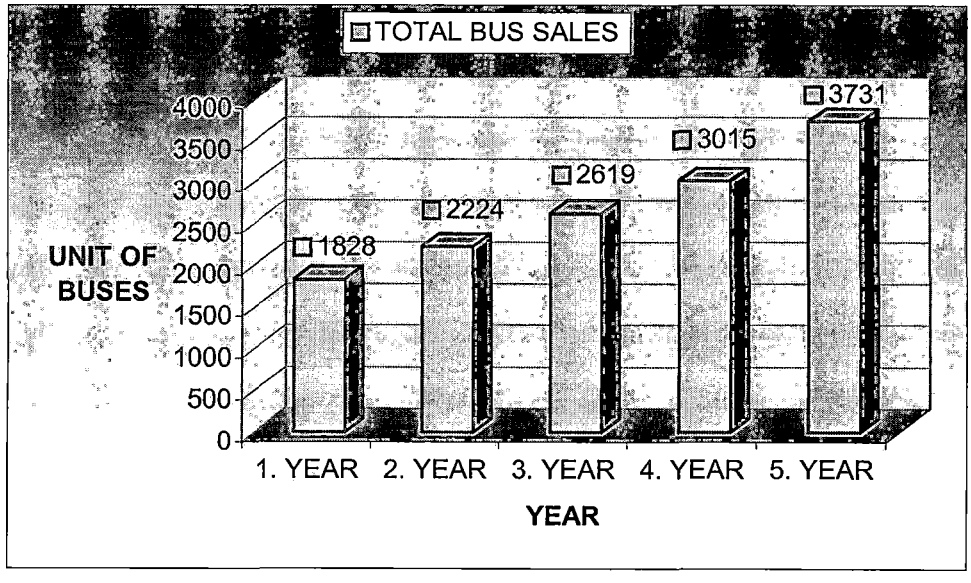


Figure 12. Targeted School Bus Sales in Units, Year 1-5

The targeted market objectives in the first five years can be summarized with the following statements:

1. The quality of products and services will be the main strengths of the XYZ Corporation.
2. The capacity of the manufacturing facility can be extended according to the market demand. All the alternative fuel systems must be implemented such as propane, natural gas, and so forth.
3. The lifecycle of the products offered and the warranties for the products must be longer than that of any other competitors. Operating costs of the alternative fuel buses should be cheaper than the current diesel and gasoline fueled buses.
4. Marketing activities and needs of the customers should be reflected in research and development activities.
5. Communication with the potential customers should be based on the direct-factory sales model, so it is essential to create an effective sales force.
6. The pricing strategy of the buses should be determined according to competitive position within the market.

Pricing/Gross Margin (Price Levels, Discount Structure)

The price of each bus will be determined by the length, quantity of order, alternative fuel selection (natural gas, propane, hybrid/electric) and competitive pricing. A penetration pricing strategy will be implemented to target the alternative fuel segment that already exists, such as natural gas buses. XYZ Corporation's unique product such as Hybrid/electric school buses will be offered at a premium price level. This market advantage will allow a sustainable premium margin.

The following example provides information regarding the selling price of the Hybrid/electric school bus and cost structure.

The projected selling price of the model HES is set by XYZ Corporation for the first year at $520,000. Parts and labor costs for each HES buses are estimated to be $260,000 and $64,000 respectively. The total cost of HES model school bus will be $324,000. Detailed information will be provided in the following sections.

Table 15 provides information the average prices of the transit buses offered in the United States.

Table 15. Average Prices of Transit Buses Offered in the United States

TYPE OF VEHICLE	AVERAGE PRICE ($)	TYPE OF VEHICLE	AVERAGE PRICE ($)
Articulated (55'-60')	438,000	35' Transit (32'6"-37'5")	274,000
Intercity (35'-45')	364,000	30' Transit (27'6"-32'5")	233,000
45' Transit (45')	386,000	Suburban (35'-45')	299,000
40' Transit (37'6"-42'5")	289,000	Small Vehicle (<27'6")	135,000

Source: American Public Transportation Association http://www.apta.com/stats/vehicles/newbuslg.htm

Competition

Identification (Existing, Market Share, Potential, Strategic Groups, Cost Structure)

The following section provides information regarding to the competition in bus manufacturing industry. Most of the XYZ Corporation's competitors have found favorable initial acceptance of their alternative fueled transportation products sold in relatively small quantities. The United States bus manufacturing sector includes nine major companies. In terms of bus products, there are two intercity, three urban transit and four major school bus manufacturers.

In contrast to the high volume car assembly lines, buses are assembled more like aircraft or boats.

These plants are generally low volume assembly operations and are not highly automated. However, it may be observed that most of these competitors usually have not been successful in selling large quantities of (50 or more) alternative fuel vehicles, up to this time, in any city of the United States. Bus manufacturing in the United States is a declining industry with fewer competitors, some import penetration in the intercity bus segment, little product differentiation and declining real prices. The industry is characterized by lingering overcapacity, which has given rise to industry consolidation through corporate acquisitions, production facility rationalization, plant closures and company exits from the industry. Strict cost control procedures and intense price competition are additional hallmarks. Nevertheless, the urban transit and intercity bus manufacturers have produced innovative products. Urban transit bus manufacturers have introduced such new products as articulated buses, low-floor buses and buses designed for the disabled, and the intercity bus producers have introduced articulated and luxurious tour buses.

- Strategic groups

Bus manufacturers offer four distinct products serving different markets:

1. Intercity bus manufacturers: The intercity subsector consists of Motor Coach Industries Limited (MCI), and Volvo-Prévost Car Incorporated, Intercity manufacturers build primarily 40-foot and 45-foot coaches and some articulated 60-foot models. They are a specialized group of manufacturers for which intercity bus building is the main business.

The MCI intercity bus plant in Manitoba is part of the company's rationalized North American manufacturing operations. The plant produces coach shells valued at about 40 percent of the completely equipped bus.

At full capacity, the Winnipeg plant can produce over 1,000 coach shells annually, using only one work shift. The other intercity motor coach producer, Volvo-Prévost, has the capacity to produce 600 intercity buses annually, using one work shift. Privately owned carriers, such as tour bus operators, are the subsector's principal customers. In addition, publicly funded transit operators purchase some highway coaches for their commuter services.

2. Urban transit bus manufacturers: The urban transit bus subsector consists of three major companies: New Flyer

Industries Limited in Winnipeg, Orion Bus Industries Incorporated (OBI), and Nova BUS Corporation. These urban transit bus manufacturers produce 35- and 40-foot conventional buses, 60-foot articulated buses, electric trolley buses, and low floor buses. They are a clearly defined group, serving primarily the needs of municipal transit authorities. Publicly funded transit operators in the United States are the main customers for this group. These companies are capable of supplying a variety of product designs, including those for special purposes such as conveying the physically disabled. The traditional competitors in the United States are Flxible, Gillig, Neoplan and formerly TMC, which is now part of Nova BUS.

3. School buses: The school bus manufacturing subsector consists of: Bluebird Coach Limited and Thomas Built Buses. Although the school bus industry is also a clearly defined manufacturing group, school bus manufacturers that produce types A, B, C, and D school buses, often also make buses for use in small and midsized transit and shuttle bus service. Small and midsized buses, such as: transit, airport, car rental, hotel, and resort shuttles, and other shuttle applications are not discussed in this industry sector overview. These overlap with the smaller school buses and are for school bus manufacturers

the most rapidly growing market segment. Blue Bird is the leading manufacturer in the North American school bus market and distributes their products on a North American-wide basis. Blue Bird manufactures bus bodies and some bus parts, in 27, 29 and 37-foot lengths and also produces flat-nosed buses.

Thomas Built Buses is primarily a builder of bus bodies and constructs these on its own chassis as well as those manufactured by GMC, Ford and Navistar. Assembly operations are highly labor intensive with little automation. Only bus bodies are built at the plant.

Of the United States market for transit buses, OBI (Orion Bus Industries) and New Flyer had 22 percent and 78 percent respectively. MCI and Volvo-Prévost, the two intercity bus manufacturers, depended heavily on the United States domestic sales. The competition among the manufacturers is usually their market segments that these companies have been involved. Most of the bus manufacturers involved in more than one market segment. The following companies are the industry leaders for different market segments.

1. Blue Bird Corporation: The largest school bus maker in the United States, Blue Bird also produces commercial buses and high-end motorcoaches. Founded in

1932 by A. L. Luce Sr., Blue Bird is now a subsidiary of UK-based bus builder Henlys Group PLC and Volvo International Corporation. A network of more than 90 independent distributors sell the company's buses and motorcoaches to government entities (school districts), churches, businesses, and nonprofit organizations. Blue Bird's school bus division offers buses that carry from 12 to 90 passengers. Some models feature natural-gas engines and special needs lifts. The company also provides financing and leasing services. Blue Bird have four manufacturing facility and 3,000 employees. Blue Bird Corporation does not have public information regarding its market share and financial performance

2. Thomas Built Buses, Inc.: Thomas Built Buses is one of North America's largest full-line bus manufacturers offering products in the school transportation and specialty markets. Thomas Built Buses, Inc. was founded in 1936. Thomas Built Buses, Inc., is a wholly owned subsidiary of Freightliner LLC, a DaimlerChrysler company. The company has more than 50 distributors and 1,600 employees. In 2001 Thomas Built Buses, Inc. produced 14,000 vehicles.

3. Nova Bus Corporation: Nova Bus Corporation, a division of Prevost Car Inc. (which is a subsidiary of

Volvo Bus Corp. and Henly's Group of Great Britain) specializes in the design, production and marketing of city transit buses, suburban and commuter buses, and aftermarket parts. Their products include a heavy-duty transit bus in 30-foot, 35-foot and 40-foot models and a 40-foot low-floor bus. In 1993, the company acquired the MCI bus manufacturing plants. The company currently has four plants and over 2,000 employees.

4. Collin Bus Corporation: Incorporated in 1971, Collins Bus manufactures a full line of Type A school buses to meet the needs of any sized transportation task in any environment. The company is one of the largest US makers of ambulances and specialty vehicles such as small school buses, shuttle and midsized commercial buses, and terminal trucks. Collins also makes commercial bus chassis and medical support vans used to transport medical and life-support equipment. The company markets its products under brand names that include Wheeled Coach, Collins Bus, World Trans, and Capacity. Collins. It sells to niche markets that demand manufacturing processes too sophisticated for small job shop assemblers, but it is not the highly automated assembly line operations of mass production vehicle manufacturers. The company emphasizes specialty engineering and product innovation, and it has

introduced new products and product improvements during recent years.

5. New Flyer Corporation: New Flyer Corporation was founded in 1930 under the Western Truck& Auto Body Works Corporation. Currently New Flyer has annual sales of $400 million and employs 2,200 people. As of 2001, over 6,300 low-floor buses have been delivered, based on industry data; this represents close to half of the North American heavy-duty low-floor bus fleet. New Flyer Corporation manufactures 30, 35, 40 and 60 ft. articulated buses, including a full range of heavy duty, low-floor and high-floor buses. New Flyer is one of the leading companies in alternative fuel bus-manufacturing in the industry.

6. U.S. Bus Corporation: This company manufactures and sells Type A school buses. Approximately one out of five small buses sold in the United States were produced from U.S Bus Corporation. The company has specialized in customizing the products according to the demands, and needs of its customers.

7. Neoplan Bus Corporation: Neoplan Bus Corporation was founded in 1981. Neoplan Bus Corporation manufactures transit buses in 30-foot, 40-foot and 60-foot (articulated) lengths, including low-floor, double-decker,

suburban commuter and luxury coach models. Neoplan Bus Coporation has the largest product line in United States. The company focuses on product quality and after sales support.

8. North American Bus Industrial Corporation: NABI was founded in 1992 with a venture investment of Hungarian Companies. NABI manufactures heavy duty, low-floor and standard transit buses in 30, 35, 40, 45 and 60 foot lengths. NABI is also a supplier of after-market parts for transit buses and intercity buses of all types and manufacturers. NABI have manufacturing facilities in Hungary and North America. Both of these facilities are vertically integrated companies (collectively, NABI), and initially were capitalized by the First Hungary Fund.

The body fabricating operations in Hungary were organized under North American Bus Industries, Rt., (NABI, Rt.) a Hungarian corporation controlled by the First Hungary Fund. Final assembly operations in the United States were organized under what is now North American Bus Industries, Inc., a wholly-owned subsidiary of NABI, Rt. organized as an Alabama corporation. NABI, Inc. is wholly-owned by its parent, NABI, Rt., which is a publicly traded company owned by the First Hungary Fund, asset

management institutions and public investors. Neither is owned in any way, or to any extent, by Ikarus, Hungary.

A substantial number of Ikarus buses, produced by Ikarus USA and Ikarus Hungary are operating within the United States. These buses were produced by companies other than NABI using materials and quality procedures vastly different from those presently utilized by NABI. While they are the same general design as the standard-floor designs acquired from Ikarus Hungary by NABI the engineering and quality control systems have experienced extensive improvement. Although NABI is one of several available suppliers of service parts for Ikarus buses, NABI has no warranty, training or service obligations pertaining to buses produced by Ikarus, USA and Ikarus, Hungary. Collectively, NABI, Rt. and its subsidiary, NABI, Inc. currently employ approximately 800 persons, divided roughly 50/50 between the two companies.

9. Thor Industrial Corporation: Thor Industrial Corporation is the second largest recreational vehicle (RV) manufacturer and the largest commercial bus manufacturer in North America. Corporate headquarters are located in Jackson Center, Ohio, and they are publicly traded on the New York Stock Exchange under the symbol THO. Total sales for the 1998 fiscal year ending in July

were $700 million, $200 million of which was commercial buses. Thor is a very forward thinking company that focuses on customer satisfaction and product quality while maintaining a lean and strong management structure.

Eldorado Corporation was founded in 1979. Eldorado National Corporation has produced 30,000 commercial buses operating in a vast variety of public and private transportation applicantions as a subsidiary of Thor Industrial Corporation. The Company has three manufacturing facilities with current annual production averaging approximately 2,600 vehicles. Eldorado National has 10 different models, range from 20' to 37' in length with a capacity range of 10 to 37 passenger transit and intercity buses. In alternative fuel technology, Eldorado National Corporation current offers LPG, CNG, LNG and hybrid electric buses. Thor Industrial Corporation currently has 4,000 employees.

10. Other Bus Manufacturers: Other than the manufacturers mentioned above, there are some small size bus manufacturers existing in alternative fuel bus industry, which are currently small in terms of production and sales capacity. These companies are Ebus, and Advanced Vehicle Systems, both of them privately owned companies. In 1998, Ebus, Inc. was formed to design and build

electric and hybrid-electric transit buses and shuttle vehicles. AVS has maintained the lead in the development of advanced technology electric and hybrid-electric transit buses and now manufactures 12-year heavy-duty buses up to 38-feet in length.

Strengths (Ability to Satisfy Customer Needs)

The bus manufacturing companies have three core strengths: marketing, finance and engineering. Especially the school bus manufacturers offer financial services by utilizing their financial resources. Take the largest school bus producer, Blue Bird, for example. It offers credit to increase and promote the sales besides bus manufacturing. Beside the financial strength of the companies, most subsidiary companies have substantial support from the parent companies in terms of human resources and technology.

The other important factor is the marketing skills of the corporation. These companies, which play an active role in the industrial associations and regulations, have significant advantages over their competitors. To compete in the market, intercity bus manufacturers have designed and produced new buses that are more appealing to the rider and superior in performance. The number and locations of the distribution channels are the strengths

of the many bus companies. For example, Blue Bird Corporation has over 90 sales locations in the United States.

Despite the strengths that big corporations have, the small and specialty bus manufacturers have good and experienced engineering skills. The bus manufacturing process is quite different from mass car production. It requires customization depending on the customer requests. Although the sales in units for some bus manufacturers are low, those companies generally have better engineering skills. For example, Advanced Vehicle Systems Corporation developed transit electric buses.

Weaknesses

According to Truck and Bus Builder, the weaknesses of the alternative fuel buses are related to the product features and poor engineering skill. The companies, that have automated production systems, have to change the manufacturing and assembly operations. These require substantial capital investment and marketing skills to keep and persuade customers to buy the new products developed. A few of the problems related to the product features in alternative fuel buses can be stated in the followings:

Limited range or autonomy of the alternative fuel buses, especially if they are "pure electric"; that is, with no range-extending auxiliary power unit on board the bus.

- Underpowered or low-powered configuration of the alternative fuel buses, especially electric buses making, it often unsuitable for climbing steep hills, not having rapid acceleration, nor being able to maintain highway speeds, thus slowing traffic and causing traffic congestion. Again these conditions are most often associated with the "pure" electric buses, not hybrids, since they were usually designed with lower power electrical motors and improving range before having to stop and recharge.
- High maintenance related to design and manufacturing defects, including inadequate chassis and suspension strength, durability and functionality. Often these buses are built by competitors that are essentially "bus body builders" Their experience was usually in previous conventional bus building where they had been buying a ready-made chassis and

suspension system and building onto it the bus body.

- High initial acquisition and long term operating costs which are directly related to the design and manufacture of the bus, including expensive energy storage systems that increase the cost per passenger mile/kilometer.

The conclusion for the weakness of the competitors in bus industry: the manufacturing facilities and assembly operations are not designed to manufacture the alternative fuel buses. Although some companies developed alternative fuel buses, serial production cannot be accomplished due to the poor research and development skills and unorganized marketing efforts with the manufacturing processes.

Barriers to Entry (Cost, Time, Technology, Human Resource, Porters Five Factors)

The following section provides information regarding the competitive environment and barriers to entry in alternative bus manufacturing. The main factors affecting the industry can be classified in the following statements:

1. Initial Investment: The initial investment to build up manufacturing facility and gain access

to distribution channels requires a substantial level of investment. According to the information from the consulting companies and industry averages, it is estimated that the level of investment for opening a bus-manufacturing facility requires approximately $50 million.

2. Management and Marketing Skills: The management should have a flexible structure to interact with the technical issues and customers. The marketing department needs to build up strong relationships with the customers and distribution channels.
3. Engineering Skills: The key to penetrate the market depends on the successful products, which requires sophisticated engineering skills and experience of the designers. The research and development effort can be utilized in the market, and it is essential to simplify the manufacturing process to lower the costs and minimize the outsourcing level during the manufacturing process.
4. Competition Among Existing Firms: There are a few companies in every market segment as

mentioned before. The competition among the industry leaders is high, and most of these companies have strong financial backgrounds.

5. Bargaining Power of Customers: The bargaining power of the customers is high, where the quantity of the unit sales is high. Most of the customers can get tax incentives and credits for alternative fuel vehicles and buses.
6. Bargaining Power of Supplier: The suppliers of the bus manufacturers are known as original equipment manufacturers (OEM). Those manufacturers have great power over the bus manufacturers, but most of the industry leaders such as Daimler-Chrysler integrated backward to minimize the power of the suppliers in bus manufacturing. (Thomas Built Buses)
7. Threat of Substitute Products: The substitutes for bus transportation are railway, subway and automobile. Subway and railways cannot substitute for school buses entirely due to limited location distributions in many places, but subway and rail systems are potential substitutes for intercity and transit buses.

8. Threat of Potential Entrants: The potential entrants to the bus manufacturing industry are low due to the difficult regulations and procedures, and risky investments. The companies that are involving in the automotive sector are already involves in bus manufacturing, including Volvo and Daimler-Chrysler.

CHAPTER THREE

PRIMARY RESEARCH

Methodology

This research was done in an effort to determine the future of alternative fuel buses in the United States and how bus users perceive this new transportation tool. Since there are certain limitations such as time and of course funds for proper research, all the research processes will be conducted in the San Bernardino area including daytime and nighttime in order to cover various kinds of population.

The main objective of this research is to hear from the bus users themselves about alternative fuel buses as opposed to the traditional diesel-fueled buses. Since the alternative fuel buses are still in the development stage of their product life cycles, many people may feel that the quality of the bus is not that good; others may think it is the way of the future. XYZ Corporation believes that the research results will be quite helpful for the management to determine what kind of buses should be offered in the market in the next few years, and will also be the best opportunities for bus users to clearly express

their opinions about what kind of mass transportation tools are considered best for them.

This research will be conducted to truly reflect the different roles of bus buyers and bus riders because most bus riders seem to agree that air pollution caused by alternative fuel buses should be reduced when compared to traditional buses, which may lead to air pollution as a top incentive for taking the alternative fuel buses. As we move into this new technological era, it would be wise for XYZ Corporation to start investing more in alternative fuel buses not only for business purposes but also for helping environmental protection.

Research Objectives

1. Assess social, economic and personal factors that affect the way bus users view alternative fuel buses.
2. Compare bus users' attitudes toward alternative fuel buses with their attitudes toward traditional buses.
3. Analyze differences and similarities in answers, based on bus users' demographics, such as nationality, age, and gender.

4. Uncover bus users' opinions on alternative fuel buses and structure deemed vital for XYZ Corporation to penetrate the market.
5. Detect incentives that would encourage bus users to ride on alternative fuel buses.
6. Determine the future implications of alternative fuel buses in the United Sates.

Population

The purpose of this research is to evaluate the attitudes of a sample of bus users in San Bernardino, including high school students and senior groups, and bus users who have taken buses on a regular basis. In the United States, many bus users include school students, senior groups and handicapped people. Since one of the research objectives is to determine the future of alternative fuel buses in the Unites States, the population in San Bernardino would be the source of a convenience sample to study.

Sample Plan

Questionnaires will be given to bus users in high schools and senior or nursing homes who are willing to answer the survey questions. Also, some questionnaires will be given to the students who take summer school in California States University, San Bernardino, because most

of these students finished high school in the area and probably had experience taking buses. One major limitation to this research may be sample size. The sample was relatively small which may present issues of reliability.

Development of Questionnaire and Collection of Data

Based on the objectives described above, it was determined that a questionnaire would be the best research method for attaining the data. It is the optimum method available to compare answers and to gain insight into their attitudes toward alternative fuel buses.

According to the sample plan, 156 questionnaires were constructed and questions developed based on survey objectives. Specific answers to some of the questions are needed, so both dichotomous, closed-ended questions and multiple-category, closed-ended questions were used. Also scaled-response questions were used to test the degree of importance for some of the factors related to alternative fuel buses. On certain topics where more information is desired, open-ended questions were used. All questionnaires were standardized (see Appendix B).

A pretest using 15 questionnaires was conducted. Complaints were received about the number of open-ended questions included in the survey. Students and senior

groups were reluctant to answer too many open-ended questions. It was therefore decided to turn some of these questions into scaled-response questions, making it easier and more tolerable for respondents to answer, yet still giving an idea of the degree of importance of the factors involved. In order to minimize the possibility of incomplete response or missing data, the questions were purposely designed to be short. Additionally, questions were kept simple and to the point to minimize reader misunderstanding.

Final return rate statistic results are as follows:

1. Total number questionnaires distributed: 156
2. Total returned: 150
3. No response number: 6 (No experience in taking any kind of buses before).

The results were gathered and tabulated using Statistical Program of Social Science (SPSS) and Microsoft Excel. Frequency tables and cross tabulations were constructed and were used to analyze the data. The basic statistical function frequency from each question offered percentages to compare the differences among all answers with a pictorial view. Cross tabulation was used in further analysis to describe the relationship between the

impact of utilization of alternative fuel buses and the possible bus fare increase.

Results

The collected questionnaire data were collected by SPSS 9.0. The results were analyzed by the function frequency of the SPSS. All frequency tables and figures are attached in Appendix A. The following is the questionnaire breakdown and analysis.

Questionnaire Breakdown and Analysis

1. Have you ever used a public bus or school bus for transportation?

   Yes 1

   No 2 (Terminate interview and thank respondent)

   In order to get 150 copies of useful questionnaires, 156 questionnaires were given to respondents at random. Six out of 156 respondents had no experience in taking either a school bus or public bus before and the interview was immediately terminated.

2. How often have you ridden the bus to travel?

   According to the descriptive statistics, the median is 5 and also the mean is almost 5. This means most people do use buses occasionally or frequently. It matches that almost 63 percent of respondents ranked

at least 4 on the scale, and they do use buses as their transportation tool (see Appendix A, p. 126).

3. For what purposes did you travel by bus?

I ride the bus to go to work 1

I ride the bus to go to school 2

I ride the bus to visit friends 3

I ride the bus to go shopping 4

Others (Please Explain) 5 _____

An analysis of question 3, which shows that over 80 percent of the respondents ride buses to go to school or work. Only 38 percent of the respondents use buses to travel for more than one purpose and only 20.5 percent of the respondents use buses for more than two purposes. 12 respondents chose option 5 due to the reasons such as car broke down and long distance trip (see Appendix A, p. 127).

4. Are you aware of the use of alternative fuel buses in public transportation? (Any other than diesel and gasoline)

Yes 1 No 2 No Opinion 3

In question 4, almost 59 percent of the respondents are aware of the alternative fuel bus in public transportation. The rest of the respondents either

don't know or had no opinion (see Appendix A, p. 128).

5. Could you please tell me what kind of alternative fuel buses you have heard about it?

Natural gas (Including Liquefied natural gas and/or Compressed natural gas)	1
Electric	2
Hybrid electric	3
Propane	4
Methanol	5
Others (Please Explain)	6 _____
None	7

In this question, 68 percent of respondents have heard about natural gas buses and 24 percent of respondents have never heard about any alternative fuel bus. Also, seven percent of respondents have heard about the electric bus and another two percent have heard about the hybrid bus. It can perhaps be suggested that most respondents have only heard about natural gas buses because some bus operators have already been operating natural gas buses since two years ago and have barely heard about other alternative fuel buses. XYZ Corporation should put

more emphasis on the awareness of alternative fuel buses in public (see Appendix A, p. 129).

6. Could you please rate the efforts of the following organizational groups to promote the use of alternative fuel vehicles in transportation?

   A. Federal Government.

   B. State Government.

   C. Bus Operators

For question 6, upon asking people to use a scale of 1-7 to rate the efforts of the federal government, state government and bus operators to promote the use of alternative fuel vehicles in transportation, 78 percent of the respondents rank 4 or below in question 6 A, 67 percent in 6 B, and 55 percent in 6 C. This indicates that the public thinks these institutions are not putting enough effort promoting the use of AFV. Bus operators are the best among these three, probably because some natural gas buses have been operating in some cities, and the public has not heard about the federal and state government giving reimbursement to support the use of AFVs (see Appendix A, p. 130-133).

State your agreement or disagreement with the following statements:

7. The use of alternative fuel buses to prevent air pollution?

   From question 7, it is obvious that most respondents agree the use of alternative fuel buses prevents air pollution; the percentage of people who rank 6 or 7 is almost 84. This result represents a great opportunity for XYZ Corporation because the public is concerned about the environment, in which they live, and do want to have clear air and clean energy (see Appendix A, p. 134).

8. Bus fares and/or tax rates should be increased in order to buy alternative fuel buses for public transportation?

   From the frequency table, 59 percent of the respondents ranked 4 or up, and they seem to agree that bus fares and/or tax rates will be increased in order to buy alternative fuel buses for public transportation. However, almost 30 percent of respondents ranked 3 or below; they do not want higher bus fares or taxes. From the descriptive statistics in this question, the mean is 4.60 on the 1-7 scale and the Standard Deviation is 2.25.

Respondents have different perceptions in this question. Due to the higher cost of alternative fuel buses that bus operators need to pay, it is very possible that these costs will transfer to the bus users. Considering this, bus users and bus operators stand on different sides, but of this issue almost 60 percent of the respondents are willing to pay more for the clean air, which also represents great opportunities for XYZ Corporation (see Appendix A, p. 135).

9. The public should be encouraged to use bus transportation?

   According to the table, 89 percent of the respondents ranked 4 or up, it can be interpreted that the respondents seem to agree that the public should be encouraged to use mass transportation more (see Appendix A, p. 136).

10. There are enough mass transportation bus routes to travel to destination points?

    Based on the survey results, almost 76 percent of the respondents ranked 4 or below on the scale, and they do not agree there are enough bus routes (see Appendix A, p. 137).

11. Mass transportation buses run often enough?
Based on results of the frequency table, 62 percent ranked on the 1-7 scale 4 or below, and 13 percent chose no opinion. This adds to almost 76 percent. Of these respondents, most seem to agree that buses are not running often enough (see Appendix A, p. 138).

12. Bus operators should no longer purchase diesel buses?
In this question analysis, the mean is almost 6 on the scale and the Standard Deviation is 1.75. Also, 83 percent of respondents ranked 4 and up on the scale; they agree that bus operators should no longer purchase diesel buses (see Appendix A, p. 139).

13. Bus operators should stop operating diesel buses?
In question 13, 68 percent of respondents agree bus operators should stop operating diesel buses, the results are parallel where the public agrees diesel buses cause a lot of polluting effects in question 15 (see Appendix A, p. 140).

14. I am very comfortable when traveling by bus?
In this question, 48 percent of respondents ranked 3 to 5 on the scale; they seem to feel at least comfortable when riding the bus. 32 percent of respondents ranked 6 or 7 on the scale, and they agree with feeling very comfortable when riding

buses. This adds to 80 percent of respondents feel not that bad or very comfortable when riding buses. Only 6 percent of the respondents ranked 1, which is not comfortable at all when riding the bus. It may be interpreted that the public like riding buses if they need to (see Appendix A, p. 141).

15. Diesel buses cause a lot of polluting effects?

When compared to question 7 the use of alternative fuel bus to prevent air pollution and this question diesel buses can cause a lot of polluting effects, 83 percent of respondents ranked 4 and up on the scale, and it may be suggested that the public have a bad image about diesel buses because they cause a lot of air polluting (see Appendix A, p. 142).

16. What kind of bus do you prefer to ride?

Large Size (40 feet)	1	Small Size (27 feet)	3
Medium Size (34 feet)	2	No Opinion	4

In question 16, 61 percent of the respondents prefer to ride large buses (40 feet) and 17 percent of respondents prefer to ride medium size buses (34 feet). Only 5 percent of respondents prefer to ride small size buses [27 feet] (see Appendix A, p. 143).

17. What kind of alternative fuels should the bus operators purchase in the future?

Natural gas (Including Liquefied natural gas and/or Compressed natural gas)	1
Electric	2
Hybrid electric	3
Propane	4
Methanol	5
Others (Please Explain)	6 _____
Don't know	7

In this question, 63 percent of the respondents think that bus operators should buy natural buses in the future, which lead to the same result with question 5. Most respondents seem to know natural gas buses only. The awareness rate of the electric and hybrid electric buses are relatively low, which may require XYZ Corporation to emphasize on promoting the awareness of the alternative fuel buses (see Appendix A, p. 144).

18. What category best describes your age?

Under 15	1	60-74	5
15-24	2	over 75	6
25-44	3	Non-Response	7
45-59	4		

Noteworthy is the fact that over 81 percent of respondents are in the age category of 15 to 49 years old (see Appendix A, p. 145).

19. What is your ethnicity?

Asian	1	African-American	4
Anglo-American	2	Other	5
Latino	3	Non-Response	6

In terms of the actual breakdown of students themselves, almost 58 percent are recorded as Anglo-American and Latino, and 25 percent are Asian and Africa-American. Others and non-response amounted to 12 percent (see Appendix A, p. 146).

20. What is your gender?

Female	1	Male	2

Females amounted to 54 percent of respondents and males amounted to 46 percent of respondents (see Appendix A, p. 147).

21. What is your educational level?

Post Grad/Professional	1	High School	4
Graduate School	2	Non-Response	5
College	3		

A breakdown of our sample shows that almost 70 percent of the respondents surveyed are at least high school graduates, while 20 percent did not respond. This result matches the sample plan and the research area, where most of the questionnaires were done at CSUSB and adjacent area (see Appendix A, p. 148).

Additionally, a cross tabulation was constructed in order to understand the relationship between the awareness of the alternative fuel buses among respondents and their intention to support the use of alternative fuel buses (see Appendix C, Table 1). The cross tabulation between these two questions revealed that the respondents who are aware of the alternative fuel buses also, support the use of alternative fuel buses for public transportation more than the people who are not aware of this opportunity. The respondents who do not have an opinion strongly disagree with the use of the alternative fuel buses. Out of 14 participants (nine percent) who have no opinion for the question did not support the possible bus fares increase, to facilitate the purchase of new buses.

The questions mentioned before were chosen to understand the public intention for public transportation and demand for the alternative fuel buses. Among the 150 surveys, 30 percent of the respondents support the increase in bus fares in order to buy the alternative fuel buses. However, the difference among respondents shows that the rest of the sample has different perceptions and opinions. In order to understand the difference, the following sample t-test was conducted (See Appendix C, Table 2). The mean difference for this particular question is approximately 4.60, which is considerably high. As a conclusion, in the perception of the respondents, they have different opinions about the increase for bus fares and taxes.

The next question was chosen in order to determine the general demand for public transportation rather than for buses. Although above 63 percent of the respondents believe that public transportation should be encouraged, the rest of the respondents support other solutions such as personal vehicles. This difference causes a huge mean difference of over 5.75 among the results of the participants in the survey.

Recommendations

According to the research, some following suggestions may be important to XYZ Corporation.

(1) Price

Low price is always a good way to attract people. However, due to the high cost of manufacturing alternative fuel buses, it is hard for XYZ Corporation to offer bus operators cheaper buses and finally benefit the bus riders, even though bus operators need to opt in the foreseeable future partly because the clean air regulation.

(2) Reputation

Currently, there are few competitors in the alternative fuel bus field. If XYZ Corporation can build a good reputation for their products, it can be very competitive in this field.

(3) Products

Companies offer unique and suitable products to attract buyers. Services after sales are extremely important in the bus industry. Due to the higher service cost of alternative fuel buses, it is critical for XYZ Corporation to help bus operators reduce the service cost and the product's lifetime.

Given the findings of the survey, the following recommendations regarding the measures XYZ Corporation should put in place to ensure a successful venture into the alternative fuel bus arena are made.

First and perhaps foremost, XYZ Corporation should indeed aggressively enter the alternative fuel bus market for market preemption. The company should incorporate this format not only because failure to do so might mean being surpassed in what is believed to be a potentially lucrative market, but also because such a measure could only serve to enhance the already existing traditional buses. XYZ Corporation has noted brand equity with bus operators as well as the business community, and this distinction would be a unique advantage over the competition.

To this end, the Marketing Department at XYZ Corporation could benefit from the data attained from conducting this survey. The value of the response surveys present main sources of satisfaction and dissatisfaction regarding alternative fuel buses, as reported by bus users. Some of the positive aspects include more efficient and less polluting transportation, a higher commercial awareness for alternative fuel bus uses. Probable marketing campaign for such buses, should emphasized and

highlighted these facets in order to catch the attention of prospective bus consumers.

Conversely, elements of the perceived main sources of dissatisfaction such as higher cost of maintenance, mechanical problems with battery lifetime, comfort of riding buses, and bus fare increase should not be emphasized. Rather, the XYZ Corporation should seek to put measures in place to ensure smooth and effective technical operations of the buses. Having superior product features with good technical capabilities should combat these perceived problems.

Secondary research revealed that other companies currently active in offering alternative fuel buses are charging a premium for this product, and that bus users are quite willing pay the price. However, our findings in the survey seemed to suggest just the opposite; that respondents are either willing to paying more or not if bus operators need to transfer these costs to them. So, XYZ Corporation would have to definitely do more research on its pricing strategy, and see what price the market could indeed bear to pay.

In terms of how soon XYZ Corporation should incorporate this bus into the market, collected data suggest that it should avidly continue the foundational

work necessary in producing alternative fuel buses because most respondents agree that diesel buses cause a lot of polluting effects and bus operators should stop purchasing diesel buses. In order to ensure that it quickly becomes a major market shareholder in this regard, XYZ would need to increase staff with technical skills and marketing capabilities.

Finally, this survey revealed that respondents think that bus operators should offer more bus routes in order to initially attract the public to the use of alternative fuel buses. Some of the responses here made suggestions of the use for sun buses, offering more bus routes, and working with bus operators to offer frequent bus rider discount.

CHAPTER FOUR

ENVIRONMENTAL ANALYSIS

Technological

In the global market, government policy usually has an important impact on the bus industry as a consequence of public policies for regulation of technical standards, funding of urban transit authorities, school bus needs, preference for locally-made vehicles, regulation of the intercity carrier industry, and special needs like access for the handicapped. The urban bus manufacturing industry is currently experiencing significant product changes. For example, changes in bus designs are attributable to customer demand, legislative requirements, and vehicle safety regulations. School bus production has been consistent historically both in terms of unit produced and overall growth. School buses represent over 88 percent of the entire bus manufacturing market in terms of the number of units produced in the United States. Over the years there have been few changes to the design of these buses, but some major product changes are now more likely to occur. As a result of this largely stable market environment the major school bus manufacturing companies

in the United States can anticipate a modest growth due to replacement needs and population growth.

Also, most government programs have been affected by decreased funding. The results are being felt especially by school boards and urban transit authorities, that benefit from government assistance for bus purchases. For example, since almost all urban transit authorities are largely government subsidized, reduced government assistance, especially in the United States, is exacerbating their financial difficulties and discouraging them from purchasing new buses to meet the current regulations. Consequently, most transit authorities and school boards are trying to extend the life cycle of older buses that would normally be replaced and this is having a significant impact on the demand for new buses. The technological improvements in the industry can be summarized with the following categories during the recent years:

1. Alternative Fuel Systems
2. Low Floor Bus
3. Handicapped Access Doors
4. Articulated Bus

Governmental

The industry is profoundly influenced by government policies, regulations and subsidies. New government environmental regulations, standards mandated by the United States, and changes in urban transit ridership have required manufacturers to make changes in basic bus body design and propulsion systems. Since the early 1980's American intercity bus transportation subsection has also experienced a steady decline in ridership. This decline can be attributed to the deregulation of the United States commuter airline and railroad industries, high-speed, multi-lane intercity highway building, accompanied by a consistent increase in private automobile ownership. However, these changes have not been able to reverse the downward trend in ridership and there is no indication that it will change in the foreseeable future. The changes in emission standards and mandatory purchase of alternative fuel buses will increase the sales of alternative fuel buses.

The Clean Air Act of 1990 changed the regulations for emission standards for all of the mobile vehicles. This act mainly requires and pushes the bus operators to buy the alternative fuel systems. The following statement is

directly taken from the United States environmental protection agency.

The Clean Air Act Amendments of 1990: SEC. 219. URBAN BUS STANDARDS.

(a) Standards for Model Years After 1993. - Not later than January 1, 1992,the Administrator shall promulgate regulations under section 202(a) applicable to urban buses for the model year 1994 and thereafter. Such standards shall be based on the best technology that can reasonably be anticipated to be available at the time such measures are to be implemented, taking costs, safety, energy, lead time, and other relevant factors into account. Such regulations shall require that such urban buses comply with the provisions of subsection (b) of this section (and subsection (c) of this subsection, if applicable) in addition to compliance with the standards applicable under section 202(a) for heavy-duty vehicles of the same type and model year."

Demographics

Although the population keeps going up in the United States, the bus sales and services, and public transportation has not been increasing in the same proportion. The effects of population growth among the bus

segment mostly feel by the school bus demands. According to US census the population size in the United States was 284,796,887 in 2001.

The population studies done by U.S. Department of Commerce show that the population will continue to increase and also school age US residences are expected to increase. This increase will be reflected to the school bus sales and demand for overall public transportation. Table 16 provides the United States resident population projections.

Table 16. United States Resident Population Projections (in Thousands), Years 2000-2015.

Age Group	2000	2005	2015	%Change 1999-2005	%Change 1999-2015
Under 5 yrs.	18,987	19,127	21,174	0.7	11.5
% of total	6.9	6.7	6.8		
5 to 14 yrs.	39,777	40,147	40,795	0.4	2.0
% of total	14.6	14.0	13.2		
15 to 19 yrs.	19,820	20,997	21,194	5.9	6.9
% of total	7.2	7.3	6.8		
20 to 24 yrs.	18,257	19,960	21,876	9.3	19.8
% of total	6.6	7.0	7.1		
25 to 34 yrs.	37,233	36,306	41,084	(2.5)	10.3
% of total	13.6	12.7	13.2		
35 to 44 yrs.	44,659	42,165	37,598	(5.6)	(15.8)
% of total	16.3	14.7	12.1		
45 to 64 yrs.	60,992	71,113	80,846	16.6	32.6
% of total	22.2	24.9	26.1		
65 yrs. & over	35,322	36,970	45,832	4.7	29.6
% of total	12.9	12.9	14.8		
Total Population	274,634	285,981	310,134	4.1	12.9
Median Age	35.7	36.6	37.3		

Source: U.S. Department of Commerce, Population Series P-25

Economics

In comparison with car manufacturers, bus manufacturing plays a relatively small role in the United States economy, both in terms of employment and output. This has resulted in the introduction of new low-floor bus designs and the use of more environmentally friendly fuels such as clean diesel and compressed natural gas. Urban transit buses are purchased by municipal transit authorities, which are almost entirely public sector agencies and substantially subsidized. From the 1960's to the mid-1980s, urban transit bus systems have experienced substantial growth. However, between 1984 and 1988 there was no change in the demand for public transit vehicles, and since 1988 vehicle demand has decreased due to declining ridership.

This decline can be attributed to the increased use of private automobiles and the changing work environment where many businesses have located outside downtown cores, in areas where no bus service exists.

Although the overall economy is in recession, the United Sates market is still the largest market in the world and one of the suitable countries for ZYZ Corporation to invest overseas.

CHAPTER FIVE

MARKETING AND SALES ACTIVITIES

Overall Marketing Strategy

Marketing Penetration Strategy

Marketing penetration strategy will target customer satisfaction. In order to achieve this goal, the following statements will be followed.

1. The price of buses will be similar to those competitors. The price of the buses purposes the gaining the customers rather than the cost considerations during the first five years.
2. The marketing efforts will be followed up with research and development. Since the product is new and not proven to target customers, service and product warranties should be offered within the sales price. Complaints and suggestions received by the marketing department should be sent to manufacturing and design engineers. The service and warranty coverage of the buses should be longer and extended longer than any of its competitors.
3. The regions and customers mentioned in Chapter two (target market and customer analysis) should

be the first targeted geographical locations due to the large units of bus demands from those customers.

4. The financing option for should be offered with the strategic alliances through government funds, US Banks and the Taiwanese Banks.

Growth Strategy

The growth strategy for the XYZ Corporation consists of several steps. The first step is the extension of product lines and features. The focus of the XYZ Corporation will be exclusively alternative fuel bus and systems. The product line will be hybrid electric school buses, hybrid electric transit buses and intercity hybrid electric buses.

The second step is offering other alternative fuel options such as compressed natural gas, and propane relatively cheaper than hybrid electric buses and currently available by the competitors. The third step is the sales of auxiliary power systems to those countries interested in alternative fuel systems, but not in the United States. Sales of auxiliary power systems to Europe and Asia will help to built relationships with the bus manufacturers overseas and at the same time increase the number of unit sales which helps to control supplier

prices. At the end of five years, outsourcing for the bus parts should be minimized or strategic alliances should be developed such as commission over the price of the bus sold. The last step is geographical expansion to the Europe and Asia markets through the franchising of the technology. This can be achieved after ten years of sales in the United States with proven quality, technology and a strong management team.

Distribution Channels

Most of the bus manufacturers have at least 40 sales locations (refer to page 44: part C competition) and some industry leaders have over 90 distribution channels such as Blue Bird Corporation. The access to distribution channels is very difficult because current industry leaders have already built up their own distribution channels. The XYZ Corporation will not consider building up its own distribution channels due to the high cost of operating. The XYZ Corporation will use centrally managed sales force to reach their customers for the first two years. This tactic has two advantages but also several disadvantages.

Advantages:

1. Direct interaction with the customers.
2. Decreased cost of marketing efforts that can be reflected in prices.

Disadvantages:

1. The sale force may not be effective and efficient.
2. The local sales points and distribution channels pay tax to the states where they are located. The government agencies can prefer the local channels due to the return from the tax and for the purposes of the state return.
3. The physical show rooms can create more interest with the customers.

At the end of the first two years the local distributions can be accessed through alliance with privately owned bus sale companies over commissions and a few XYZ owned show rooms, sales points in strategic locations. Strategic locations will be chosen from the locations where alternative fuel systems are highly needed and where the unit sales are high, such as North America and California.

Communication

Communication is essential to create awareness among the target customers. In bus manufacturing industry in the United States, companies usually don't advertise or run commercials on television. In order to create awareness, publicity and advertising on billboards should be utilized. Both of the tactics have several advantages. First, big billboards near school districts and decision agencies for purchases can help draw the attention to the products and technologies developed by the XYZ Corporation. Sponsoring schools and school districts for the activities can create awareness such as free transportation to schools for special days with XYZ manufactured buses.

The other important communication with the customers is being an active player in industry associations and events. The current development of alternative fuel technologies and current product development can be advertised free through the industry association. Most of the research and development operations can be done with cost sharing through those associations such as Electric Vehicle Association of America or the Department of Energy and Transportation.

Sales Strategy

Sales Force

The XYZ Corporation will employ and train an internal sales force that will provide many advantages. One major advantage of having an internal sales force employed by XYZ Corporation is the ability to have more direct control over the sales staff. Information regarding sales staff performance will be easily accessible for managerial decisions. Another advantage will be the long-term sales incentives provided by the XYZ Corporation to keep the key sales staff: Sales staff would be paid whether their sales are adequate or not. This method provides the sales staff with job security and motivation.

During the beginning years of the organization the sales staff is essential for success, since access to the distribution channels take a long-time and much capital investment. In order to maximize sales, the sales staff and Marketing Department will be rewarded with commissions, stock options, and a base salary.

The size and the number of the sales teams will be determined according to region and the numbers of the customers in those regions. Each team will be under the control of the Marketing Department and will be directed by team captains. Team environment will be created in

order to stimulate the competition with competitors and among the teams.

Additionally there are disadvantages of having an internal sales force. One such disadvantage would be the costly overhead, the cost to provide benefits, including a retirement pension, for full-time employees. Moreover, mediocre sales performance would be another disadvantage of the internal staff.

Sales Activities

It is more important than ever to cultivate strong customer relationships for the XYZ Corporation. A customer-oriented—not product-oriented—mindset should permeate the sales activities for alternative fuel bus sales. The XYZ Corporation sales strategy is to build loyalty in the customer base that results in increased sales over the long term. The engineers will train the sales teams and reveal the product information for the new products developed or the products under the research processes. Other than the sales activities, each team will make a periodic situational analysis report to the Marketing Director. The report would include information about competitors' products, strategies, and customers in their region.

The daily operations include presenting products to customers directly, identifying prospects and prioritizing the prospects. The sales teams will be responsible to report customer complaints and needs to the R&D Department and to the Marketing Director. Also for improving public relations, each sales team will have its own budget managed by the team leader for sponsorships and publicity events in their regions. The team members will be rewarded not only for the dollar amount of the sale, but also for customer surveys and internal staff surveys. Ratings from the surveys will determine the value of the compensation for the performance of the team members.

CHAPTER SIX

PRODUCTS AND SERVICES

Detailed Description of Products and Services XYZ Should Offer

A scale model of its buses has built by the XYZ Corporation and presented them in foreign markets in order to generate the interest of prospective customers. XYZ Corporation continues in its research and development process with its primary products and services for the XYZ model buses in the United States market. XYZ Corporation selected the designation battery-electric/hybrid for its buses (main products) since the technical design team had added hybrid capability to the original design, which was a battery-powered, pure electric bus.

The Model "HES" (hybrid electric school bus) has been designed to provide a clean air replacement for heavy-duty school buses. This model is an environmentally improved and cost effective replacement for the thousands of diesel-fueled buses currently operating in the United States. The length of this HES model from bumper to bumper measures 39.37 feet or 12 meters. Each carries up to 80 passengers, 32 seated maximum, including 6 in fold down, wheel-chair-station-area seats. There are two steps for all passengers, including the handicapped with wheel

chairs, to enter or exit the bus. This is easier than the current buses in operation. The HES model bus climate control heating, ventilation and air-conditioning will provide passengers with comfortable travel, regardless of weather extremes. The HET (hybrid electric transit) model is still under the design and development stage of the product life cycle. Table 17 provides information regarding to technical features of the HES models.

Table 17. Technical Features of the Hybrid-Electric-School Models

HES MODELS	Features
Length	39.37 feet
Width	8 feet
Height	8.51 feet
Passenger Accommodation	32
Seats	32
Folding Seats	6
Floor at Design Height	14.6 inch
Standard Battery	Flooded Lead-Acid
Propulsion Battery Voltage	320 VDC
APU	1000kW
Second Power System	CNG-LPG
Gross Vehicle Weight	32,000 pounds
Structure	Steel space frame
Suspension	Four-Wheel Independent

Source: School Bus Information Council
http://www.schoolbusinfo.org

The second product is APU, which is the rotary internal combustion (IEC) in which turns the generator. A generator provides electrical power to storage batteries. Then storage batteries provide power on demand to each rear traction motor to propel the bus. The APU for HES and HET buses will provide 100kW output to provide a continuous maintenance charge for the batteries during bus operation: This APU will be under automatic control of the bus energy management system. The APU is developed under Taiwanese Engineering skills to provide clean technologies. XYZ model's APUs were designed with several important goals in mind:

1. Environmental advantage --runs on environmentally-accepted alternative fuel at super ultra low emission
2. High reliability -designed and manufactured to provide the user with thousands of hours of low maintenance
3. Cost effectiveness--combined acquisition and lifecycle costs can be expected to be superior to the competition, primarily because of long useful life and low APU maintenance

The services will be offered under warranty terms and agreements with the customers. Most of the aftersale

support will be based in their regional service points. The manufacturing facilities for hybrid buses and APUs will not only function as a manufacturing facility but also these facilities will be the customer service and company training points. These training points will hold classes to educate the trainees who are sent by the customers on a regular basis. The major information regarding maintenance and technical training will be given to the customers. To meet the international standards of quality, personnel will be trained in process as for control and procedures which are not only accepted commercial practices but are also in compliance with international standards such as ISO-9000 series of product standards

Ability to Meet the Needs

Physically, the Model HES meets the heavy-duty school bus standard, type C and type D school buses in the United States as well as the foreign preference for the essentially equivalent 12-meter length for the heavy-duty school buses. In general, hybrid buses are subject, as are other buses, to the basic form, fit, function, construction, configuration, operational and safety

regulatory approvals and clearances by local, state, and federal agencies.

Testing is an important part of the regulatory process. The Altoona Bus Research and Testing Center, in Altoona, Pennsylvania, was established in 1989 by the Pennsylvania Transportation Institute with funding provided by Federal Transit Administration. The staff at this center is responsible for testing new model buses as required by federal law. The XYZ Corporation's buses will not only meet the standards of the government agency but will also surpass its competitors in quality and reliability. All of the designs were created according to standards determined by the Altoona Federal Bus Testing Agency. Tests performed include the following:

- Maintainability tests for accessibility of components and subsystems
- Reliability tests in accelerated durability service, during which technicians collect maintenance data about servicing, preventive maintenance and repair
- Safety tests which compromise vehicle handling and stability, measuring bus speed through a double lane change maneuver with increasing

speeds until the driver determines the operation is unsafe or until top speed is reached

- Performance tests to determine the acceleration, gradeability and top speed capabilities of the bus. The time to speed for sequential speed increments at full throttle is measured using a stopwatch with lap timers. These data are used to generate a speed versus time plot and gradeability calculations
- Structural integrity and durability tests consisting of six different procedures:
  1. Structural shakedown
  2. Structural distortion
  3. Static and dynamic towing
  4. Jacking
  5. Hoisting
  6. Structural durability
- Fuel Economy tests to provide accurate comparable fuel consumption data on buses produced by different manufacturers. The HES model buses will be tested for fuel economy in regard to kilowatt-hours per mile required at various speed and road conditions.

Present Stage of Products and Services

XYZ Corporation has completed scale models of the type C and type D school buses and is still working on the development of transit bus models. In regard to traction motors, motor control systems, suspension and transmission of power from the electric motors to the rear wheels, the XYZ engineer teams investigated concepts that best serve the needs of hybrid buses and alternative fuel technologies. The engine and auxiliary powers systems have been completed.

The second stage of development is to build the prototype models for type C and type D school buses. This step will take 18 months while the type A and type B school bus scale models are completed at the same time. All the development of the transit models and prototype for the transit bus models will be manufactured in the United States. The followings are the R&D steps for XYZ Corporation:

1. Build the prototype for type C and type D school buses within 18 months (winter 2004)
2. Design the type A and type B school buses in 18 months (winter 2005)
3. Design the transit bus models in 12 months (winter 2007)

4. Build the prototype for type A and type B school buses within 12 months (winter 2007)
5. Build the prototype for transit bus models 27' and 40' within 12 months (spring 2008)
6. Construction of a manufacturing plant in 18 months with a capacity of 1,500 buses in the United States (summer 2009)

Competitive Advantages

The main competitive advantage of the XYZ Corporation will be cheaper R&D costs and better product quality. All the new models will be developed in Taiwan with relatively cheap cost. The R&D expenses and technical expenses will be cheaper than those in the United States.

The second competitive advantage of the XYZ Corporation is the superior quality and services of its products. All of the product offerings will be technically better than the competition. The quality of the products and services will be better than any other competitor and although the price of the buses will be premium for high quality.

The price of a hybrid electric transit bus offered by AVS Corporation is $490,000. Currently, in the United States and global markets, there is only one company offering hybrid school buses. Blue Bird Corporation made

the first hybrid school buses in the United States but the technical performance of those buses is not satisfactory. All of the R&D efforts will emphasize better performance and quality than any other competition. The price range of the type C and type D school buses will be $480,000 to $520,000 according to negotiations with customers. Also, the pricing strategy will be based on how many buses customers order at one time.

The sales teams and marketing efforts will be third competitive advantage of the XYZ Corporation. Most bus manufacturers in the United States have a large number of distribution channels owned by third parties. XYZ Corporation will have direct interaction with the customers by using an internally managed sales force.

Product Lifecycles

The lifetime of an average bus is between 10 and 12 years. The life cycle of these models is longer than that of the car manufacturing industry. XYZ Corporation does not intend to change bus models too often. Instead of changing the models, the XYZ Corporation proposes to offer better technologies and increased performance on the same models. The factors affecting the lifecycle of the products are the lifetime of the buses rather than the esthetic appearance of the buses.

Manufacturing Process and Suppliers

As of July 11, 2001, the XYZ Corporation had formed some strategic partnerships. These partners included selected OEMs (Original Equipment Manufacturers) and suppliers for components and systems used in the XYZ Corporation Manufactured buses. OEMs and others under consideration for this purpose include those manufacturing tires; windows; doors; seats and other interior components; climate control systems' propulsion systems (including electric motors, controllers and drive train components); and energy storage systems providers including battery manufacturers. The XYZ Corporation is considering outsourcing these parts rather than manufacturing themselves, in order to decrease the initial investment for the first five years of production.

The market demand for alternative fuel buses will be made stronger only by rapidly increasing the production capability in parallel with demand and satisfying customer's needs (orders) by timely deliveries. Material and direct labor costs for manufacturing the buses are expected to be reduced in several ways. Primarily, material costs will be reduced, as XYZ Corporation enters into an increasingly stronger financial position to enable it to buy material in larger lot quantities. Secondarily,

material cost reduction is expecting to be realized from XYZ Corporation's on-going research, investigation and development efforts associated with the hybrid electric bus program. Labor costs will be reduced as the personnel progress through the initial and mature stages of the learning curve associated with the XYZ hybrid electric buses. After one year, it is expected that most of the manufacturing personnel will have developed individual and team skills, which will significantly improve the efficiency or quality of buses.

It is essential to improve relationships with the suppliers for the success of the XYZ buses. According to Truck and Bus Builder Report, one worker can produce one bus every year. The first year of the production, there should be over 1,000 employees for the assembly operations in order to reach projections.

Copyrights and Patents

Patent disclosures and applications are planned, as warranted, in a timely manner, on various novel and new design features of the components and systems of the XYZ model buses. The Auxiliary Power Unit is currently registered in Taiwan. XYZ Corporation will register all technology patterns used in XYZ buses after buildup the

prototype in necessary Taiwanese and US government patent agencies.

CHAPTER SEVEN

STRATEGY IDENTIFICATION

Alternative Strategies

There are two main alternative strategies to enter the United States market. The first alternative is to enter the market as a supplier to bus manufacturers rather than manufacturing the buses. The strategic alliances with the bus manufacturers can help to lower the initial investments. Bus manufacturing requires a substantial amount of investment beside the human resources and government permissions such as manufacturing licenses. The first alternative cannot only help XYZ Corporation better understand the bus market but will also decrease the time of entry to the market and the dollar amount of investment.

The second alternative is to enter the market as a manufacturer of alternative fuel buses. The development of XYZ model buses will be completed before 2009 and the manufacturing facility can be opened by 2010 in the United States if the entire financial requirement meets the projected budget. This is not only risky but also requires ongoing efforts and a huge amount of capital.

Opportunities

The opportunity in the market is replacement of diesel buses with clean technologies. There are thousands of school buses and transit buses currently operating on diesel fuel. Environmental protection laws both in the United States and other countries affect the transportation industry deeply such as changes in emission standards. The size of the alternative fuel bus market has been increasing since 1990's after the series of clean air acts both by the federal agencies and the state agencies.

Threats

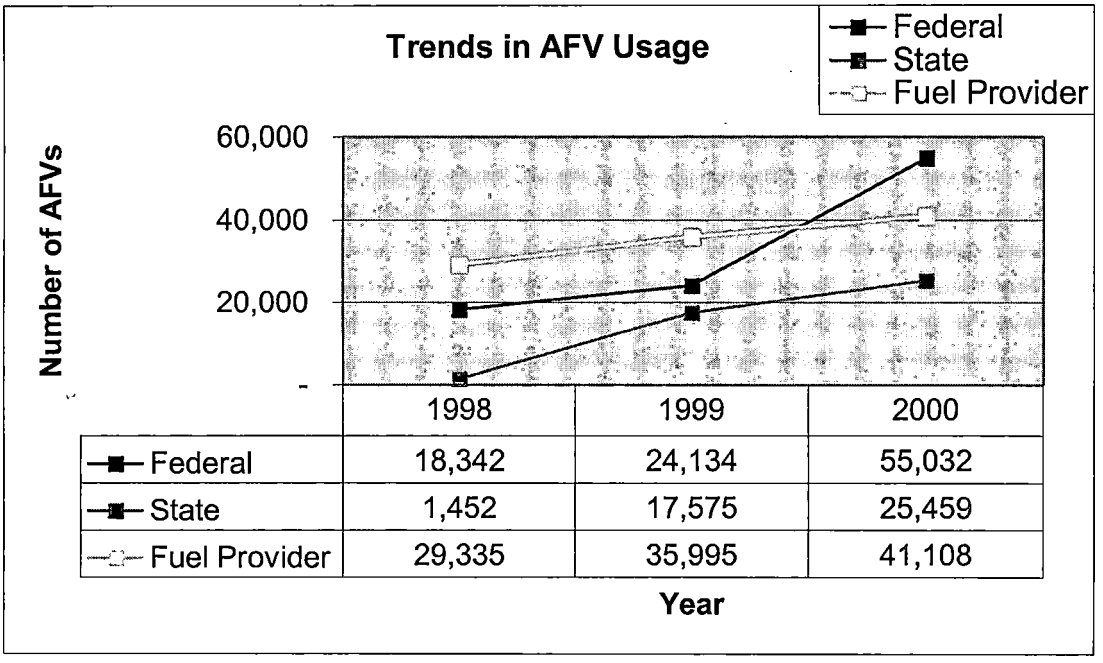
The threats in the bus manufacturing industry are associated with the level of investment and the expected changes in the market that can occur slowly due to the high cost of alternative fuel technologies. The other threats exist due to bus testing in Altoona. There is no guarantee that the XYZ models will qualify on all the standards, although R&D efforts are made according to standards. Other important threats can be classified with the following statements:

- Increased competition and competitors offering better products than the XYZ Corporation

- Changes in environmental factors such as new rules and laws to discourage the clean technologies
- Economic recession and uncertainty can decrease the size of the bus market over time

Strategy Selection

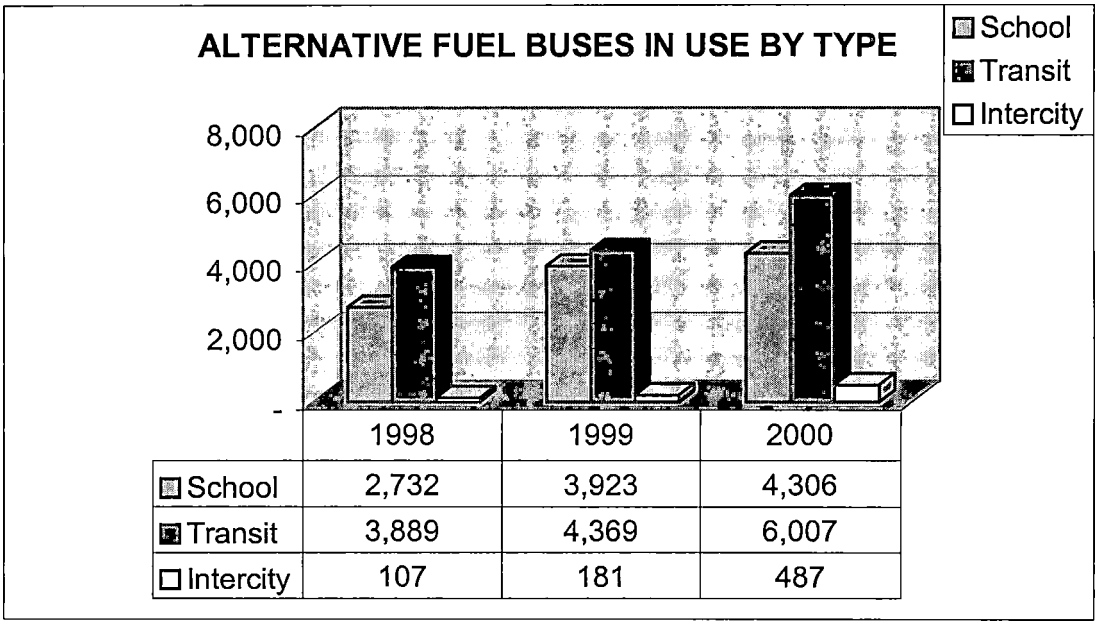
Although the second alternative is risky, the XYZ Corporation will manufacture the buses. This decision is made upon the developments in the alternative fuel market in the United States. Over a three-year period, the total quantity of AFVs in use has increased for federal, state, and fuel providers. Figure 13 provides information regarding to the use of alternative fuel vehicles in the United States. The trends for alternative fuel vehicle have been increasing since 1998. In 2000, there were over 120,000 alternative fuel vehicles operating in the United States, these vehicles included some family economic cars, such as Honda Hybrid and Toyota Echo.



Source: Form EIA-886 Alternative Transportation Fuels & Alternative Fueled Vehicles Annual Survey, 2000-2001

Figure 13. Trends of Alternative Fuel Vehicle Usage in the United States, 1998-2000

Beside the overall usage of alternative fuel vehicles in the United States, buses that use alternative fuel have been increasing between 1998 and 2000. School buses and transit buses are the leading uses of alternative fuel. Figure 14 provides information regarding use of alternative fuel buses in the United States.

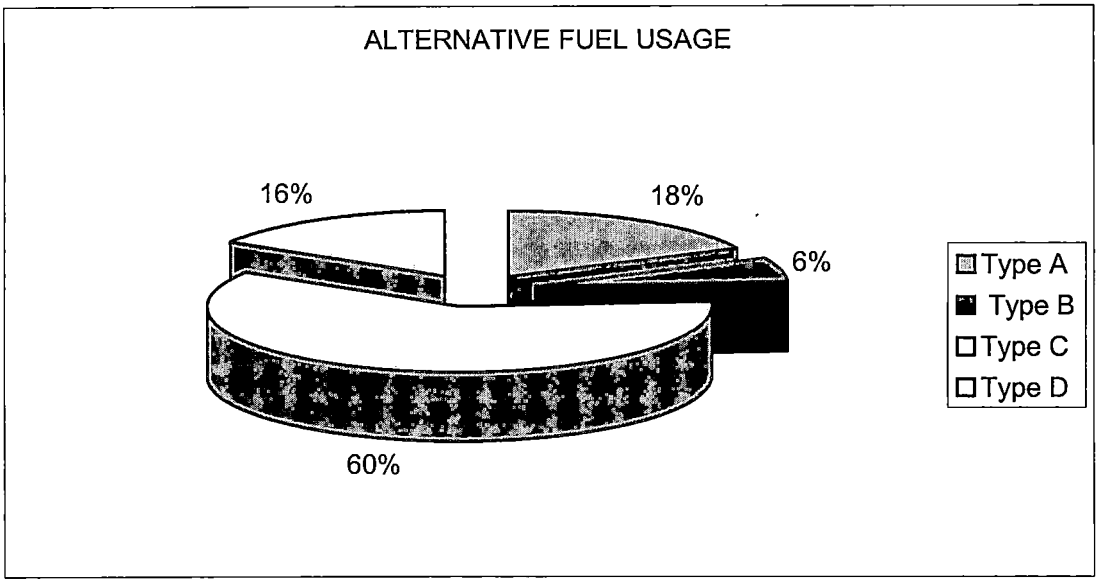


	1998	1999	2000
School	2,732	3,923	4,306
Transit	3,889	4,369	6,007
Intercity	107	181	487

Source: Form EIA-886 Alternative Transportation Fuels & Alternative Fueled Vehicles Annual Survey, 2000-2001

Figure 14. Use of Alternative Fuel Buses in the United States, 1998-2000

Of the type C school buses made in 2000, 60 percent of them were running on alternative fuel systems. The use of alternative fuel systems is more popular among the large size school buses (type C and type D) rather than the small size buses. Figure 15 provides the use of alternative fuel systems among school buses purchased between 2000 and 2001.



Source: Form EIA-886 Alternative Transportation Fuels & Alternative Fueled Vehicles Annual Survey, 2000-2001

Figure 15. The Percentage Figure of School Bus Type Purchased, 2000-2001

All of the information mentioned above strongly recommends entering the alternative fuel market as soon as possible. The bus market is relatively easier than the competition in car manufacturing. The first alternative can cause the loss of advantages over time and the sales of Auxiliary Power Systems cannot generate enough profit over time to gain sustainable competitive advantage. Because of these reasons, the production of alternative fuel school buses and franchising the technology over time is the best option. The decision is made upon market size, competition and changes in government regulations.

Financial Data and Sales Forecast

The following section provides information regarding the financial data associated with the manufacturing cost of the buses. The manufacturing of the school buses will be done directly by XYZ Corporation, the transit and intercity buses will be manufactured by the third parties through turnkey facilities. The term "turnkey" implies that the customer merely has to "turn the key'" to open the door to the facility and inside will be found the equipment materials, and documentation for assembly, quality assurance and process control necessary to assemble, manufacture, test and maintain XYZ model transit and intercity buses.

Inventory management theory defines two conflicting objectives of inventory management: Minimize the amount of inventory or maximize the availability of inventory items. The primary task of inventory management is to effectively balance these two objectives so that inventory is available to sufficiently support the demand for inventory items, while at the same time controlling the dollars tied up in inventory.

The following is the formula for inventory turnover ratio

Inventory turnover ratio (ITR) = Sales/Inventories

ITR example 1:

2001 figures for Henlys Group PLC (the parent company of Blue Bird, Nova Bus and TransBus International):

Sales = 458.53 million British pounds

Inventory = 77.95 million British pounds.

Cost of Goods Sold = 387.53 million British pounds

Inventory turnover = 5 (The firm turned its inventory 5 times per year.)

In other words, the company had 360/5 = 72 days of inventory at hand.

ITR example 2:

2001 figure for Collins Industries (parent company of Collins Bus Co., and MidBus Co.)

Inventory turnover ratio = 4.34

For Bluebird: Inventory turnover ratio = 6.07

The Industry: Auto & Truck Manufacturers

Inventory turnover ratio = 12.02

Based on the industry and benchmarked companies, XYZ Corporation's inventory turnover ratio is expected to be around 4.34. XYZ Corporation is expected to hold 360/4.34 = 82.94 days of inventory at hand.

The selling price of the XYZ buses is assumed to be $540,000, and the turnkey loyalty fee is assumed to be $10,000 per bus. The information about the estimates of

the buses that will be sold and the turnkeys to be licensed are taken from the sales projection of XYZ Corporation (see page 41). These numbers will be modified as market research and market projections continuously change. In order to estimate the cost of goods sold, parts are assumed to cost $260,000 per bus, and labor is estimated to cost $64,000 per bus, which yields a gross profit ratio of 40 percent The sale of the turnkey licenses are assumed to have no effect on the calculation of the costs of goods sold. It is assumed that marketing and sales expenses are ten percent of the total bus sales plus 15 percent of the turnkey license sales. Administrative expenses include a fixed expense of $40,000, which includes travel expenses, office supplies and utilities; and variable expense, which is assumed to be ten percent of the sales. Research and Development expenses are assumed to be five percent of the yearly net sales. Income tax is calculated according to the current corporate tax rates table. In order to calculate depreciation, XYZ Corporation is assumed to have machinery and equipment worth $537,200 and that expected life is 20 years. Using straight-line depreciation, the yearly depreciation becomes:

Depr. = $537,200/20 = $26,860

The model being developed allows for changes in bus and license selling prices, number of buses and licenses sold, and target gross profit ratio and automatically calculates the net income for the following months.

XYZ Corporation is assumed to keep an inventory of 5 buses. ($260,000*5=$1,300,000) Just in Time (JIT) production, an integrated set of activities designed to achieve high volume production using minimal inventories of parts that arrive at the workstation exactly when they are needed and can be used during production phase.

XYZ Corporation Pro Forma Income Statement Assumptions for Turnkeys

1. The selling price of the 40' buses is assumed to be $540,000, the price of the 27'5'' buses to be $399,600, and the turnkey loyalty fee is assumed to be $5,000 per bus and calculated as follows: Since the net profit margin of the industry is within the 1.2 percent and 3.5 percent range, the net profit from one bus will be $540,000/0.012 = $6,480.
2. The information about the estimates of the buses that will be sold and the turnkeys to be licensed are taken from detailed marketing

analysis and forecast of the bus sales. These numbers will be modified as market research and market projections continue.

3. a) In order to estimate the cost of goods sold, parts are assumed to cost $300,000 and labor is estimated to cost $90,000 per 40' bus. The parts are estimated to cost $200,000 and labor is estimated to cost $67,500 for a 27'5'' bus. It is assumed that it takes 2,000 man-hours to build a 40' bus, and 1,500 man-hours to build a 27'5'' bus. The hourly wage of the workers is assumed to be $45/hour.

   b) The sale of the turnkey licenses is assumed to have no effect on the calculation of the costs of goods sold.

4. It is assumed that sales of the buses produced from the future XYZ Corporation's headquarters and the turnkey license sales will be used to cover the sales and marketing expenses.

5. Administrative expenses include travel expenses, office supplies and utilities and are assumed to be ten percent of total sales.

6. XYZ Corporation is assumed to have lease expenses in the beginning of the production. The

tax advantage of leasing is considered when leasing is offered as a way of getting the equipment needed for production instead of purchasing it.

7. Interest expense is calculated considering the 2.4 percent to 5.5 percent of sales industry range and taken as 2.4 percent of the total sales.
8. The income tax rate is assumed to be 35 percent and will be changed according to the current corporate tax rate tables.

CHAPTER EIGHT

CONCLUSION AND RECOMMENDATION

The XYZ Corporation has been seeking niche markets in the United States during the last five years. The XYZ Corporation has experience as a manufacturer of heavy-duty automotive parts. Recent developments in the United States, suggest the company enter the alternative fuel bus market. The bus manufacturing industry is likely the most suitable market to enter for the XYZ Corporation, because XYZ Corporation has experience as a supplier of bus parts for China, Korea and Taiwan since 1970's. The bus industry in the United States can be separate into three segments; school, intercity and transit buses. XYZ Corporation will provide technologies for these segments while manufacturing the school buses. The school bus market size is approximately 35,000 annually. The XYZ Corporation intends to penetrate the ten percent of the large size school buses (type C and type D) and seven percent of the small size school buses within the next five years. The XYZ will develop a unique marketing strategy by using premium pricing and direct interaction with the customers through an internal sales force. Beside school buses, the XYZ Corporation will sell transit and intercity buses

through a turnkey facility owned by third parties. Turnkey facility is a part of strategy to extend the growth strategy in Asian and European markets in the future. The transit and intercity bus segment sells 6,000 units of buses annually. The XYZ Corporation targets the ten percent of this market segment within the next five years. The XYZ Corporation growth strategy consists of several steps. The first step is extension of product lines in the existing markets. The second step is exporting the alternative fuel technologies and parts to European and Asian Markets such as APU (Auxiliary Power Units). The third step is to open turnkey facilities in Asia and Europe as a part of growth strategy. All the marketing efforts and strategies aim to gain the loyalty customers rather than the profitability for the long-term purposes.

APPENDIX A

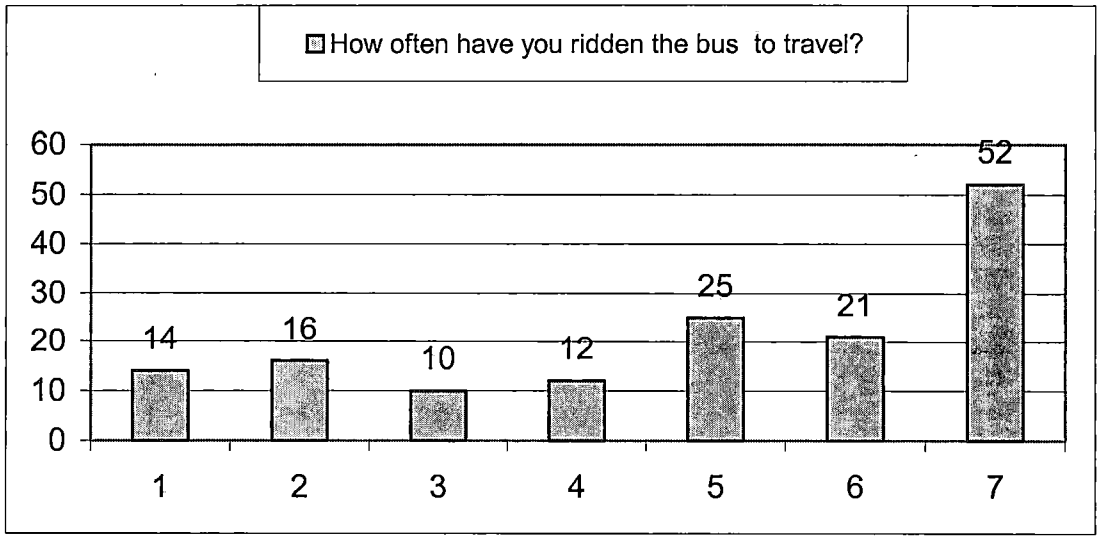
FREQUENCY TABLES AND FIGURES

2. How often have you ridden the bus to travel?

Never	1	2	3	4	5	6	7	Very Often	No Opinion

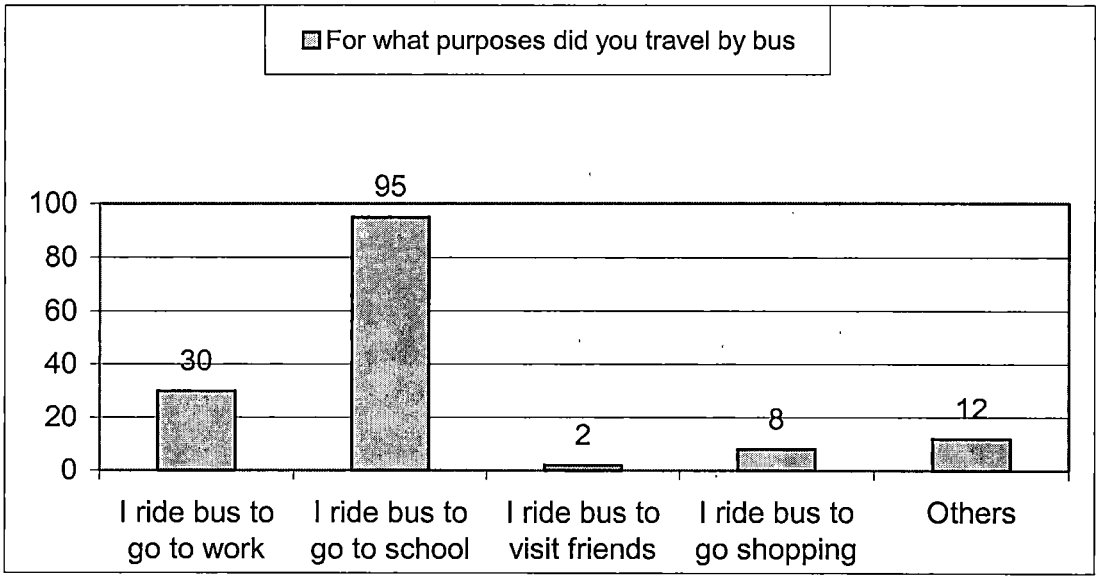
Descriptive Statistics	
How often have you ridden the bus to travel?	
N	150
Mean	4.9267
Median	5
Std. Deviation	2.0857
Variance	4.3503
Minimum	1
Maximum	7

How often have you ridden the bus to travel?		
Rating	Frequency	Percent
1	14	8.97
2	16	10.26
3	10	6.41
4	12	7.69
5	25	16.03
6	21	13.46
7	52	33.33
Total	150	100.00



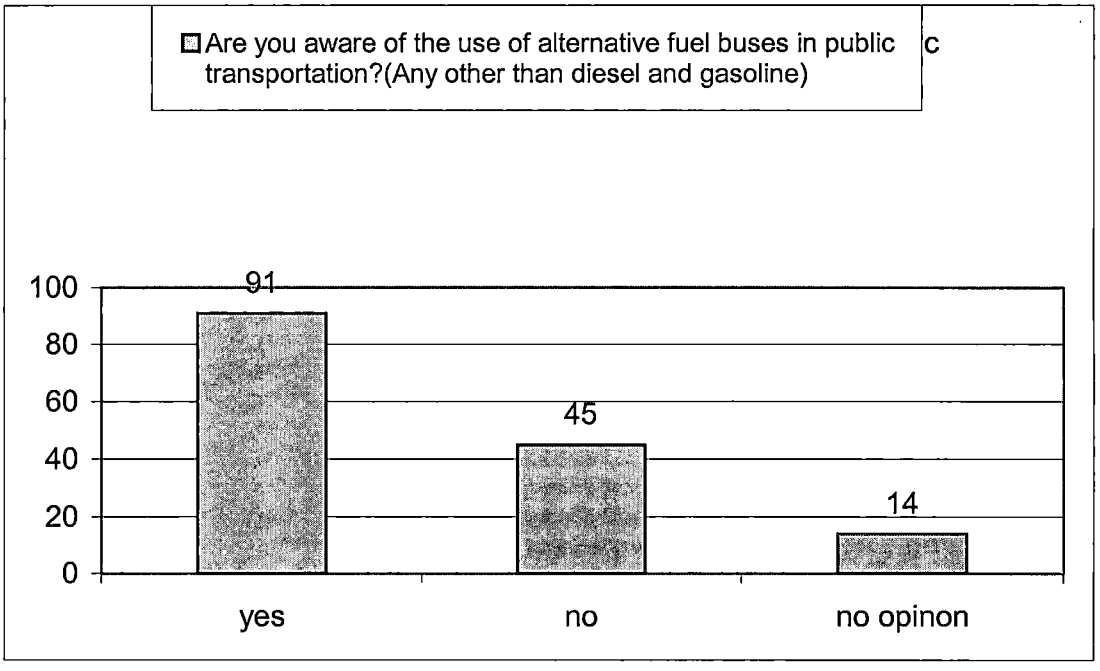
3. For what purposes did you travel by bus?

For what purposes did you travel by bus		
	Frequency	Percent
I ride bus to go to work	30	19.23
I ride bus to go to school	95	60.90
I ride bus to visit friends	2	1.28
I ride bus to go shopping	8	5.13
Others	12	7.69



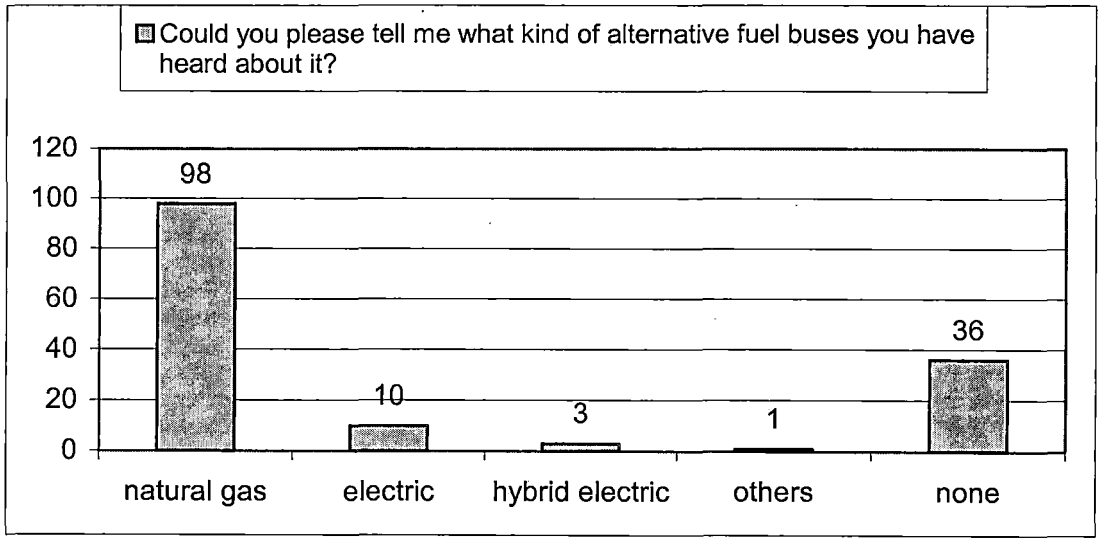
4. Are you aware of the use of alternative fuel buses in public transportation? (Any other than diesel and gasoline)

Are you aware of the use of alternative fuel buses in public transportation? (Any other than diesel and gasoline)		
	Frequency	Percent
Yes	91	58.33
No	45	28.85
No opinion	14	9.62



5. Could you please tell me what kind of alternative fuel buses you have heard about it?

Could you please tell me what kind of alternative fuel buses you have heard about it?		
	Frequency	Percent
Natural Gas	98	65.33
Electric	10	6.67
Hybrid Electric	3	2
Others	1	0.7
None	36	24

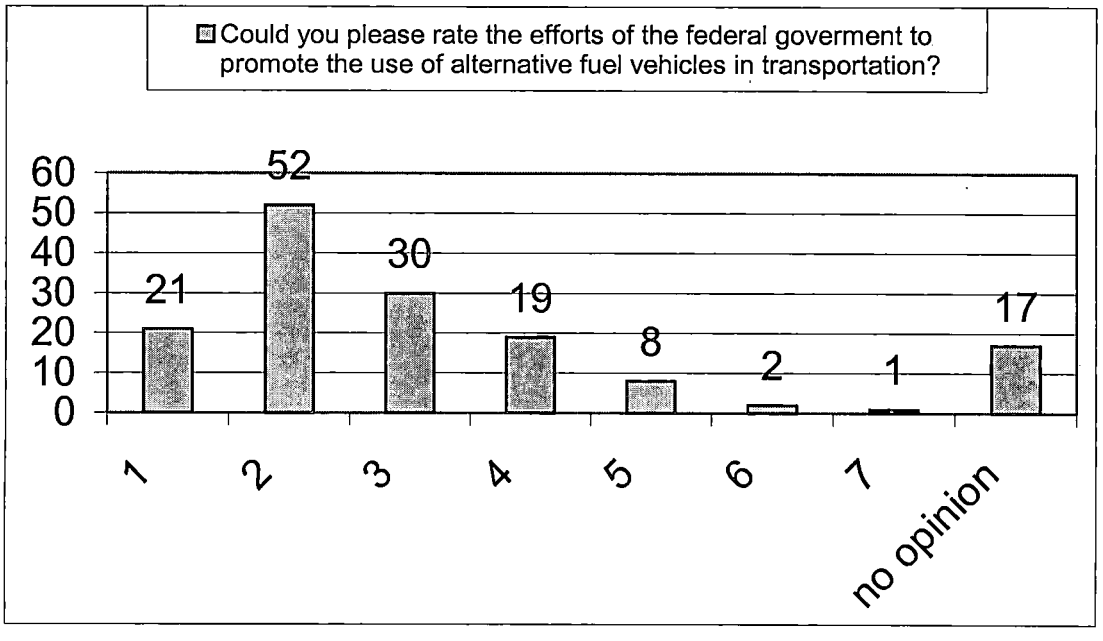


6. Could you please rate the efforts of the following organizational groups to promote the use of alternative fuel vehicles in transportation?

A. Federal Government.

Very Bad	1	2	3	4	5	6	7	Excellent	No Opinion

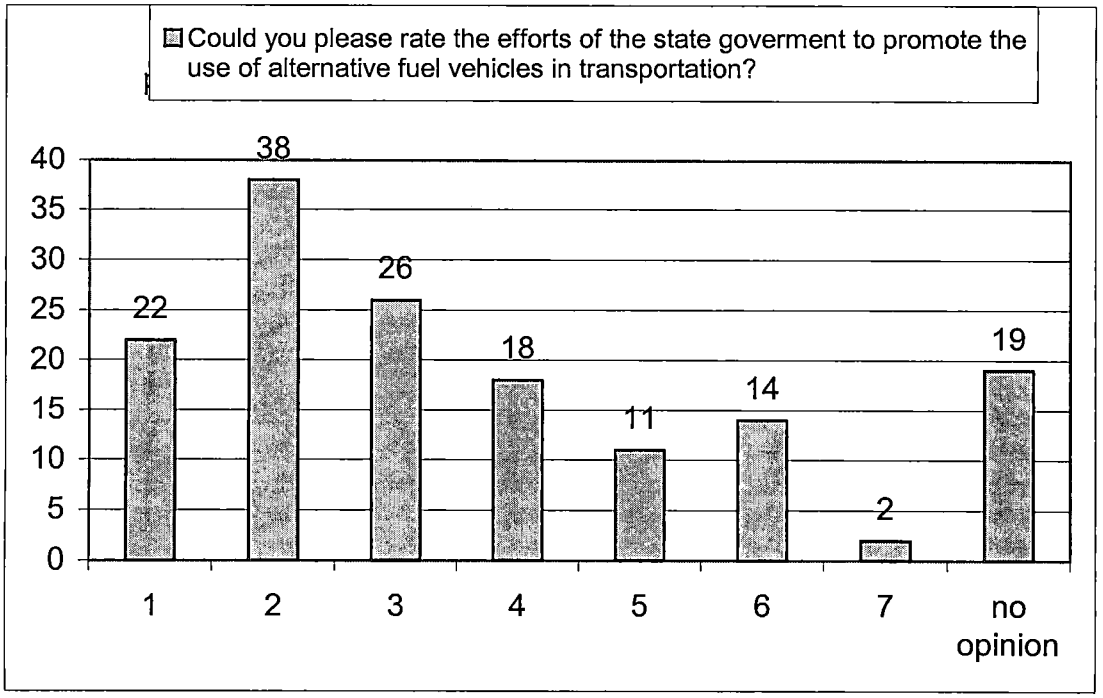
Could you please rate the efforts of the federal government to promote the use of alternative fuel vehicles in transportation?		
Rating	Frequency	Percent
1	21	13.46
2	52	33.33
3	30	19.23
4	19	12.18
5	8	5.13
6	2	1.28
7	1	0.64
No opinion	17	10.90
Total	150	96.15
Non response	6	3.85
Total	156	100.00



B. State Government.

Very Bad	1	2	3	4	5	6	7	Excellent	No Opinion

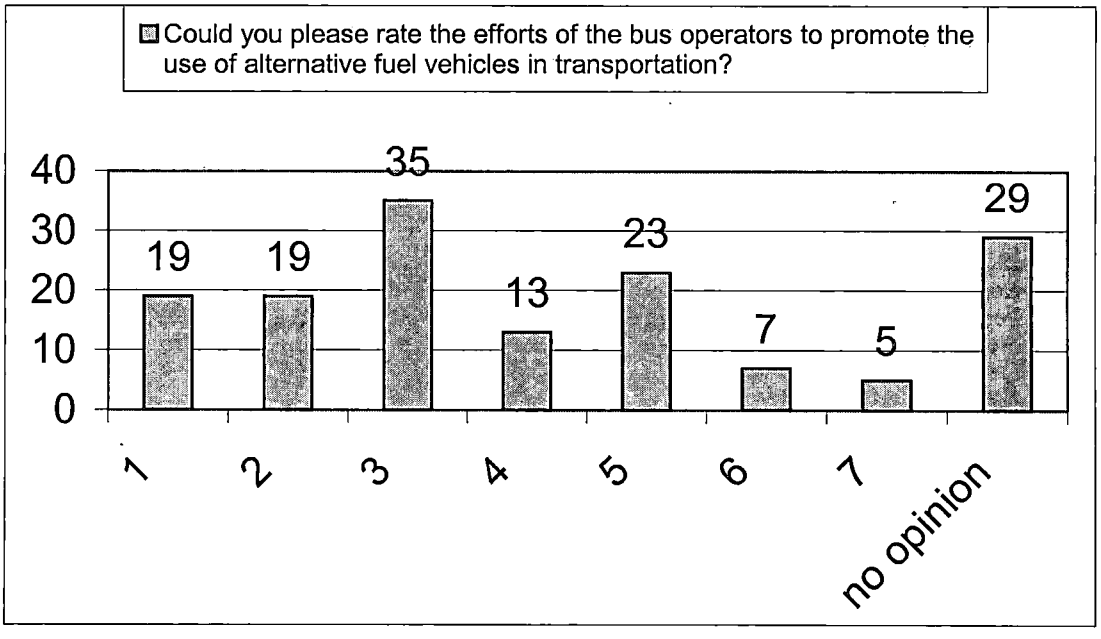
Could you please rate the efforts of the state government to promote the use of alternative fuel vehicles in transportation?		
	Frequency	Percent
1	22	14.10
2	38	24.36
3	26	16.67
4	18	11.54
5	11	7.05
6	14	8.97
7	2	1.28
No opinion	19	12.18
Total	150	96.15
Non-Response	6	3.85
Total	156	100



C. Bus Operators

Very Bad	1	2	3	4	5	6	7	Excellent	No Opinion

Could you please rate the efforts of the bus operators to promote the use of alternative fuel vehicles in transportation?		
Rating	Frequency	Percent
1	19	12.18
2	19	12.18
3	35	22.44
4	13	8.33
5	23	14.74
6	7	4.49
7	5	3.21
No opinion	29	18.59
Total	150	96.15
Non-Response	6	3.85
	156	100.00



Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var.
Could you please rate the efforts of the federal government to promote the use of alternative fuel vehicles in transportation?	150	1	8	3.24	2.06	4.25
Could you please rate the efforts of the state government to promote the use of alternative fuel vehicles in transportation?	150	1	8	3.68	2.24	5
Could you please rate the efforts of the bus operators to promote the use of alternative fuel vehicles in transportation?	150	1	8	4.25	2.36	5.56

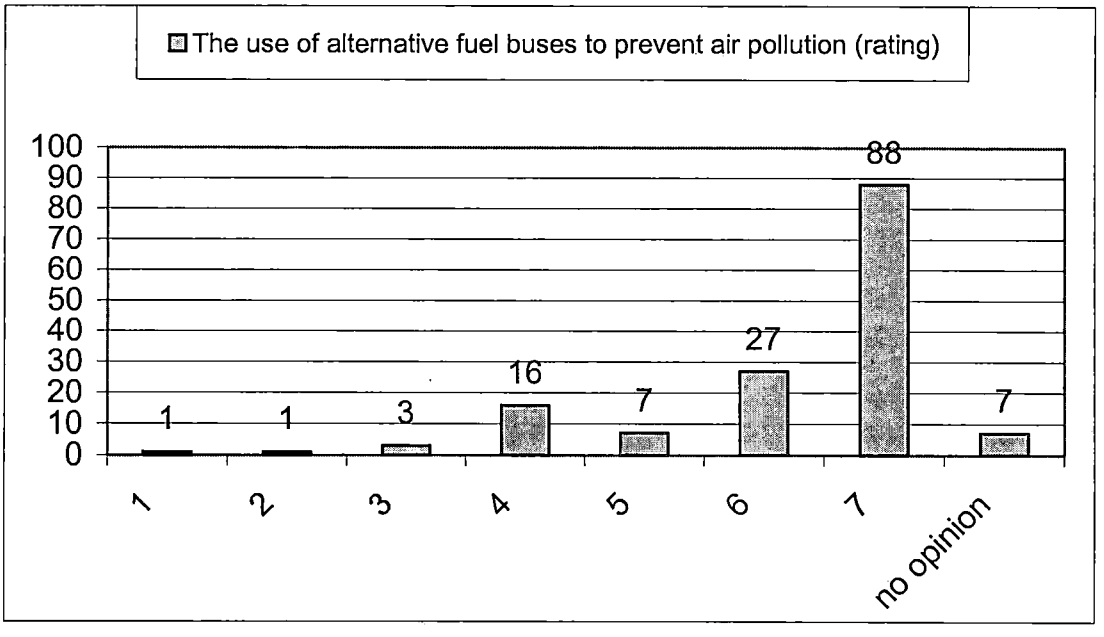
State your agreement or disagreement with the following statements:

7. The use of alternative fuel buses to prevent air pollution?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

The use of alternative fuel buses to prevent air pollution (rating)		
Rating	Frequency	Percent
1	1	0.64
2	1	0.64
3	3	1.92
4	16	10.26
5	7	4.49
6	27	17.31
7	88	56.41
no opinion	7	5.13

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
The use of alternative fuel buses to prevent air pollution (rating)	150	1	8	6.31	1.28	1.63

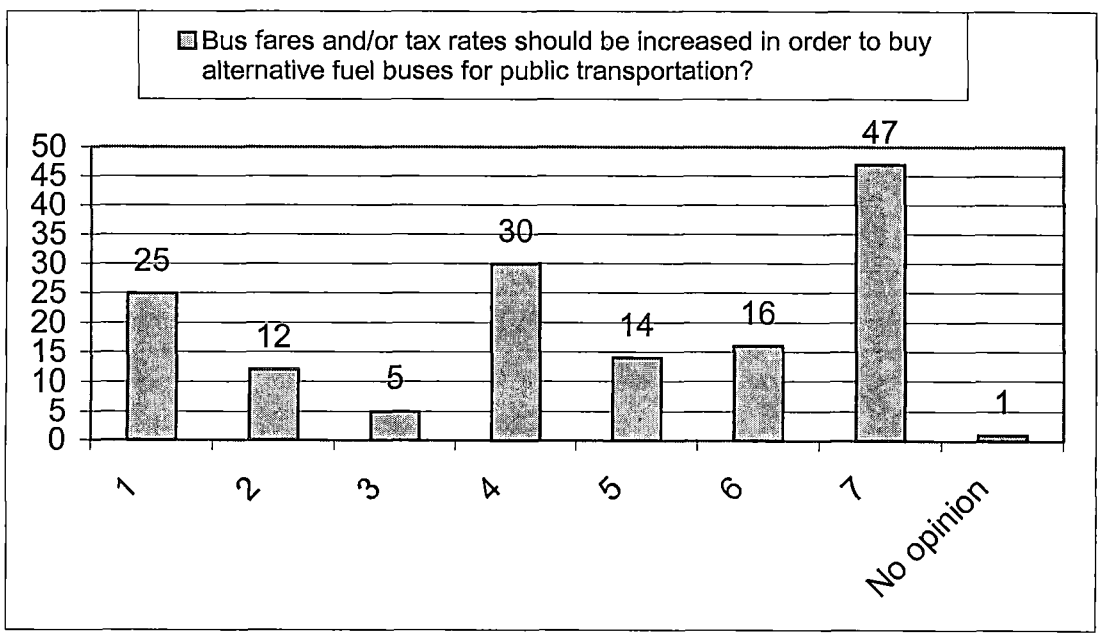


8. Bus fares and/or tax rates should be increased in order to buy alternative fuel buses for public transportation?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

Bus fares and/or tax rates should be increased in order to buy alternative fuel buses for public transportation?		
	Frequency	Percent
1	25	16.03
2	12	7.69
3	5	3.21
4	30	19.23
5	14	8.97
6	16	10.26
7	47	30.13
No opinion	1	1.28

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
Bus fares and/or tax rates should be increased in order to buy alternative fuel buses for public transportation?	150	1	8	4.60	2.25	5.04

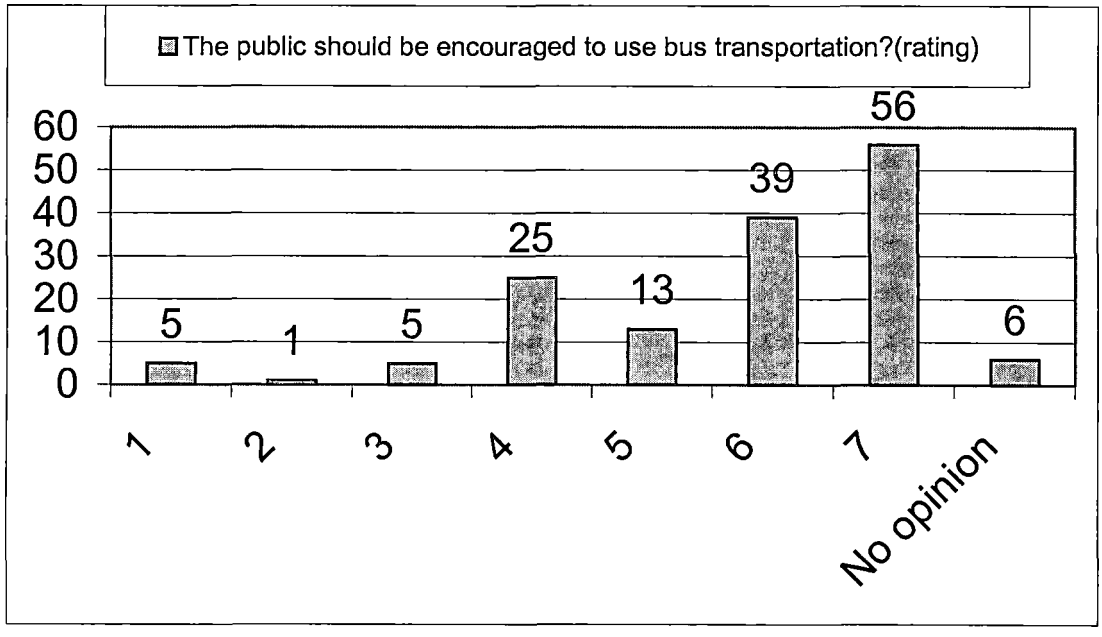


9. The public should be encouraged to use bus transportation?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

The public should be encouraged to use bus transportation? (Rating)		
	Frequency	Percent
1	5	3.33
2	1	0.60
3	5	3.33
4	25	16.67
5	13	8.67
6	39	26
7	56	37.33
No opinion	6	4

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
The public should be encouraged to use bus transportation? (Rating)	150	1	8	5.75	1.58	2.49

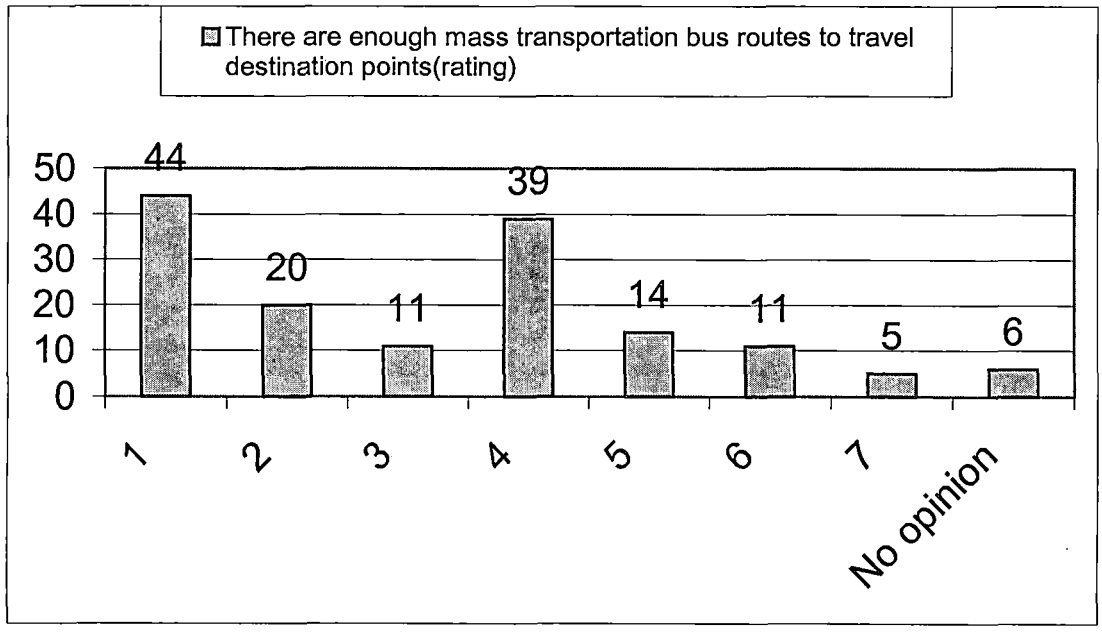


10. There are enough mass transportation bus routes to travel to destination points?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

There are enough mass transportation bus routes to travel destination points (rating)		
Rating	Frequency	Percent
1	44	29.33
2	20	13.33
3	11	7.33
4	39	26
5	14	9.33
6	11	7.33
7	5	3.33
No opinion	6	4

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
There are enough mass transportation bus routes to travel destination points (Rating)	150	1	8	3.31	2.05	4.20

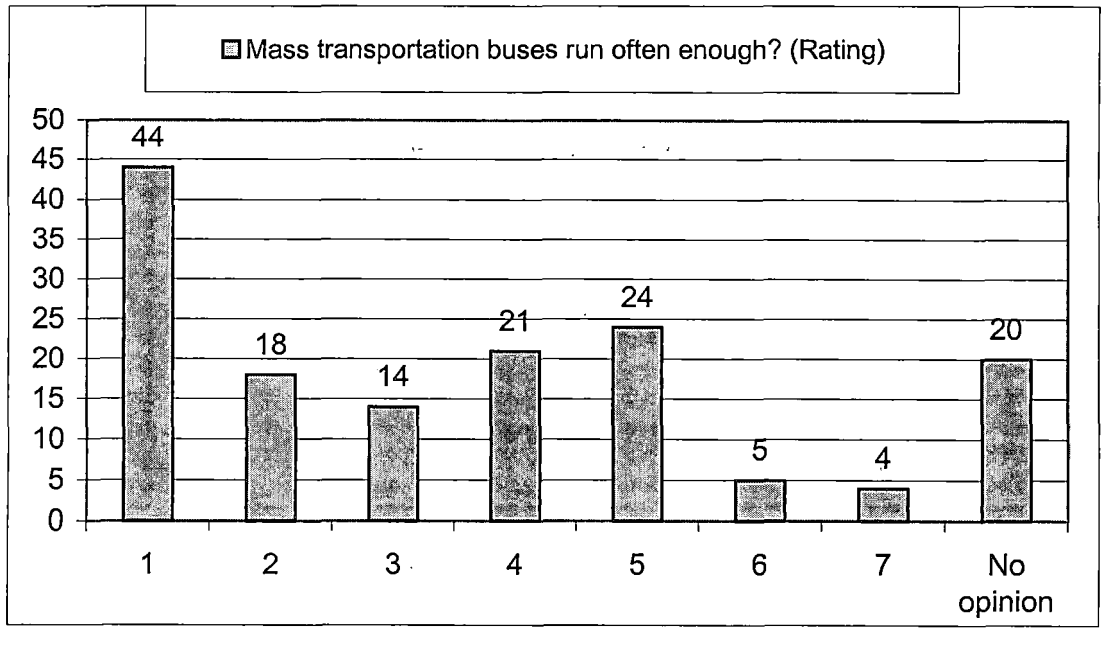


11. Mass transportation buses run often enough?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

Mass transportation buses run often enough? (Rating)		
Rating	Frequency	Percent
1	44	28.21
2	18	11.54
3	14	8.97
4	21	13.46
5	24	15.38
6	5	3.21
7	4	2.56
No opinion	20	13.46

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
Mass transportation buses run often enough? (Rating)	150	1	8	3.66	2.42	5.87

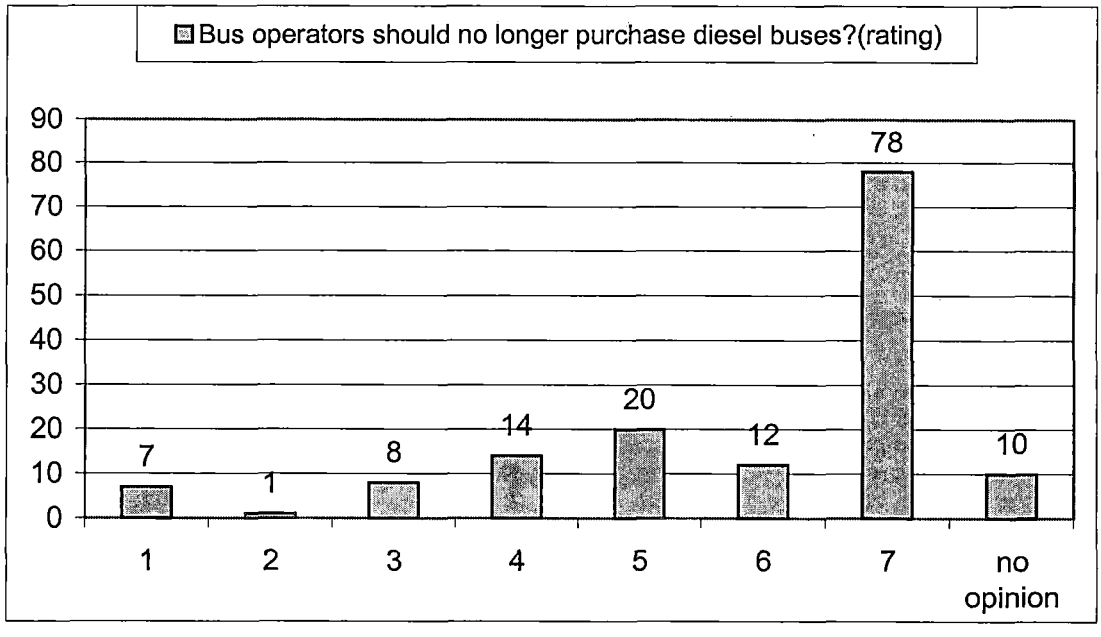


12. Bus operators should no longer purchase diesel buses?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

Bus operators should no longer purchase diesel buses? (Rating)		
Rating	Frequency	Percent
1	7	4.67
2	1	0.67
3	8	5.33
4	14	9.33
5	20	13.33
6	12	8
7	78	52
No opinion	10	6.67

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
Bus operators should no longer purchase diesel buses? (Rating)	150	1	8	5.93	1.75	3.07

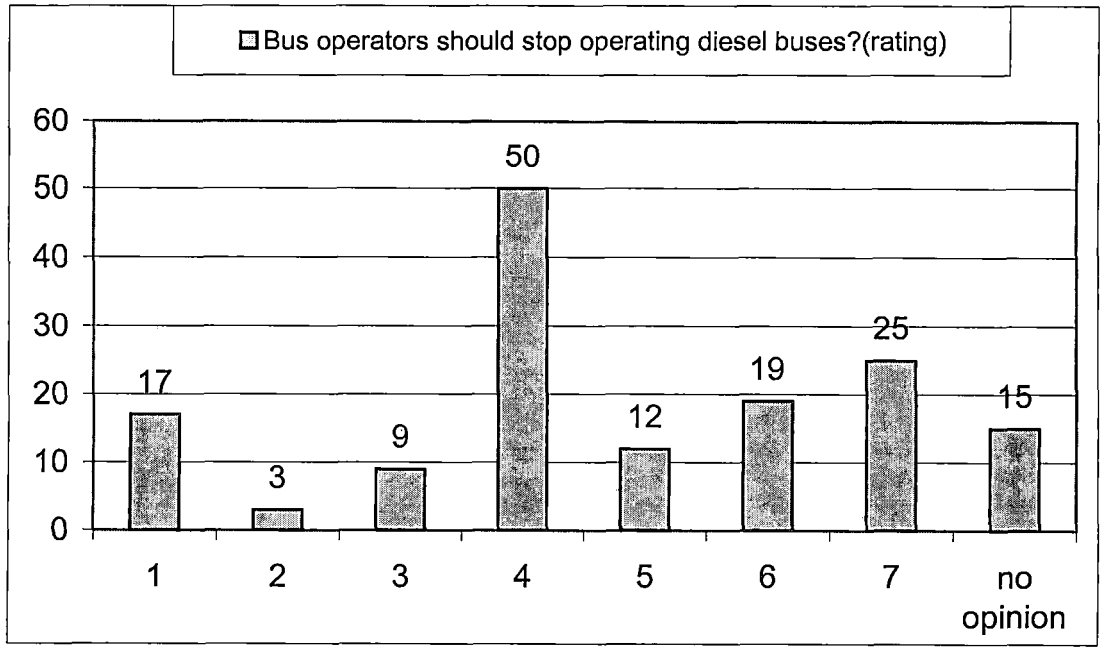


13. Bus operators should stop operating diesel buses?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

Bus operators should stop operating diesel buses? (Rating)		
Rating	Frequency	Percent
1	17	10.90
2	3	1.92
3	9	5.77
4	50	32.05
5	12	7.69
6	19	12.18
7	25	16.03
No opinion	15	9.62

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
Bus operators should stop operating diesel buses? (Rating)	150	1	74	5.25	5.99	35.94

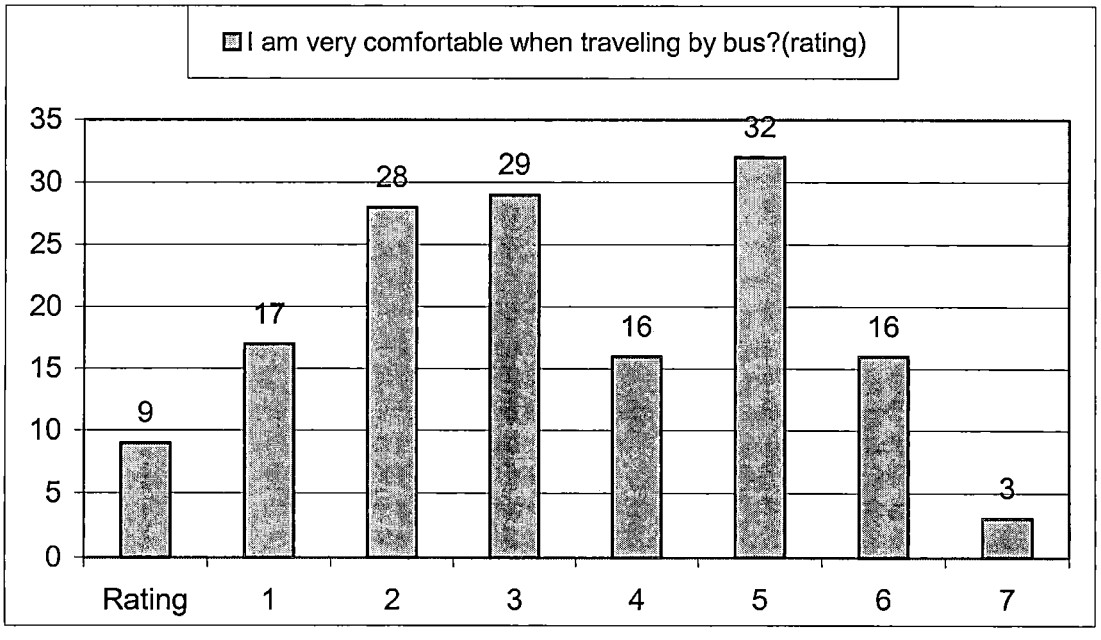


14. I am very comfortable when traveling by bus?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

I am very comfortable when traveling by bus? (Rating)		
Rating	Frequency	Percent
1	9	6
2	17	11.33
3	28	18.67
4	29	19.33
5	16	10.67
6	32	21.33
7	16	10.67
No opinion	3	2

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
I am very comfortable when traveling by bus? (Rating)	150	1	8	4.36	1.84	3.39

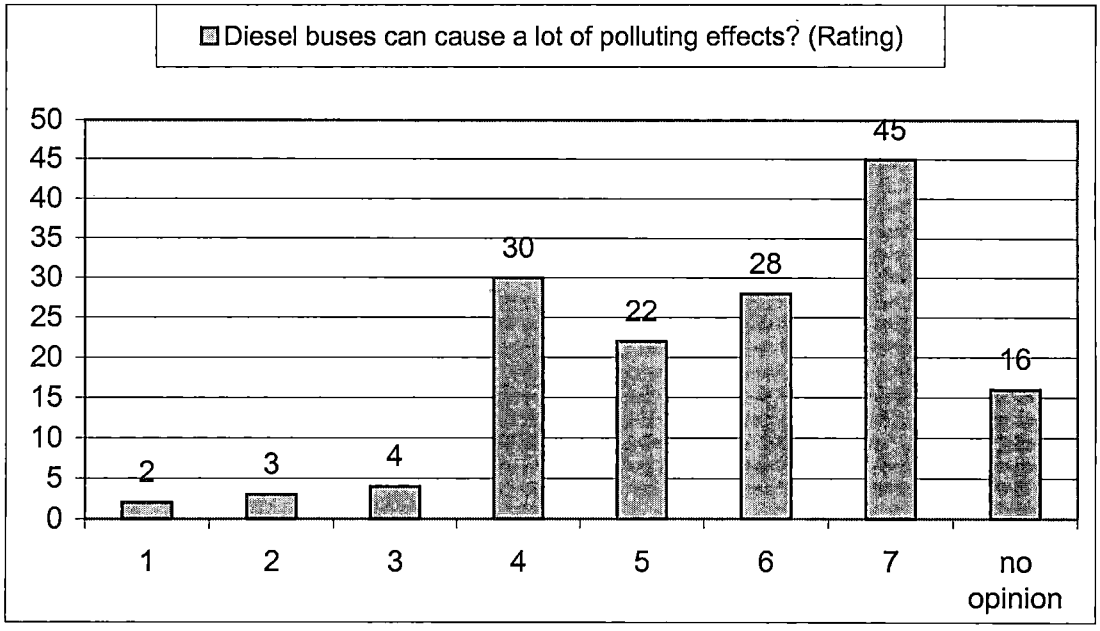


15. Diesel buses cause a lot of polluting effects?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

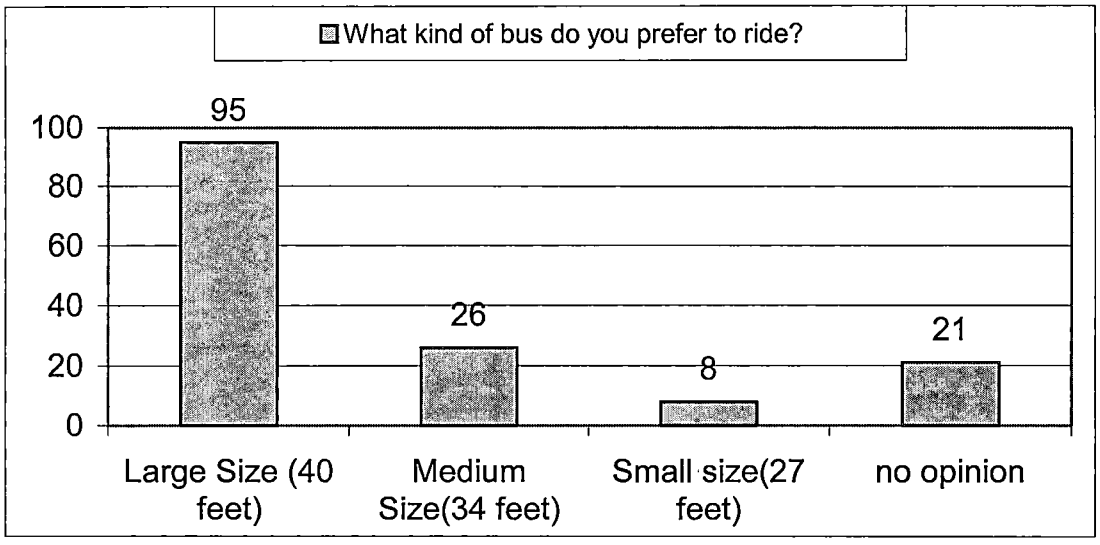
Diesel buses can cause a lot of polluting effects? (Rating)		
Rating	Frequency	Percent
1	2	1.33
2	3	2
3	4	2.67
4	30	20
5	22	14.67
6	28	18.67
7	45	30
No opinion	16	10.67

Descriptive Statistics						
	N	Min	Max	Mean	Std. Dev	Var
Diesel buses can cause a lot of polluting effects? (Rating)	150	1	8	5.75	1.59	2.53



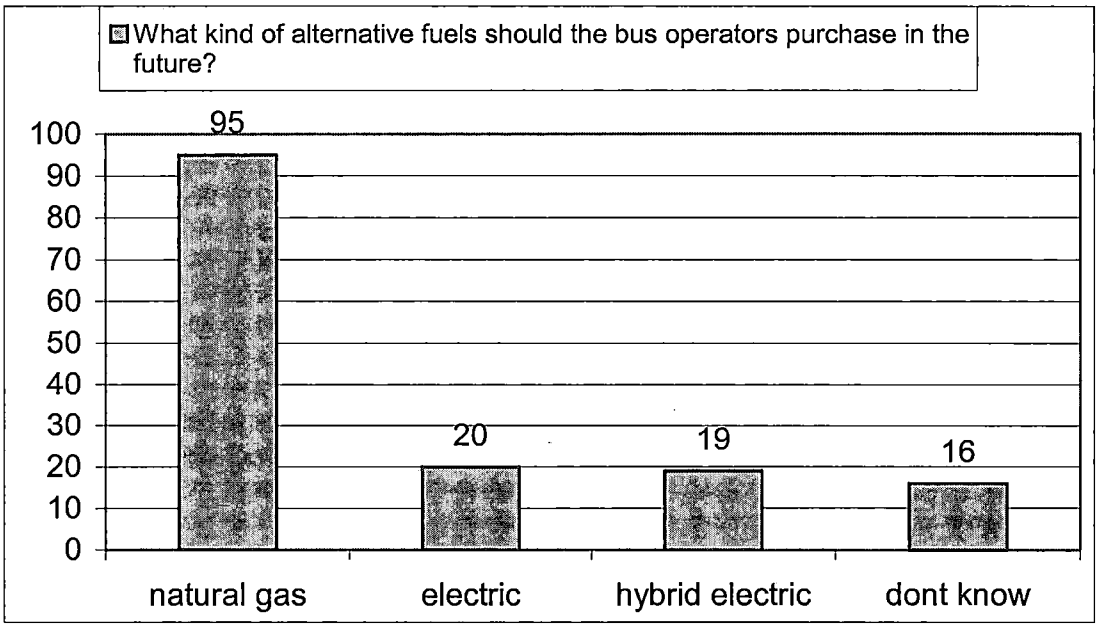
16. What kind of bus do you prefer to ride?

What kind of bus do you prefer to ride?		
	Frequency	Percent
Large Size (40 feet)	95	60.90
Medium Size (34 feet)	26	16.67
Small size (27 feet)	8	5.13
No opinion	21	13.46



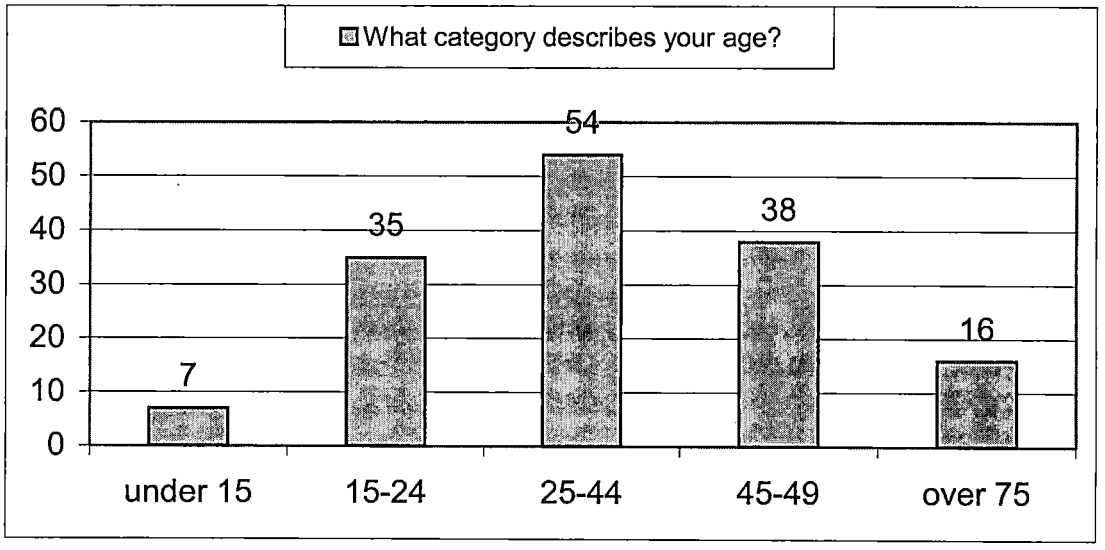
17. What kind of alternative fuels should the bus operators purchase in the future?

What kind of alternative fuels should the bus operators purchase in the future?		
	Frequency	Percent
Natural gas	95	63
Electric	20	13
Hybrid electric	19	13
Don't know	16	11



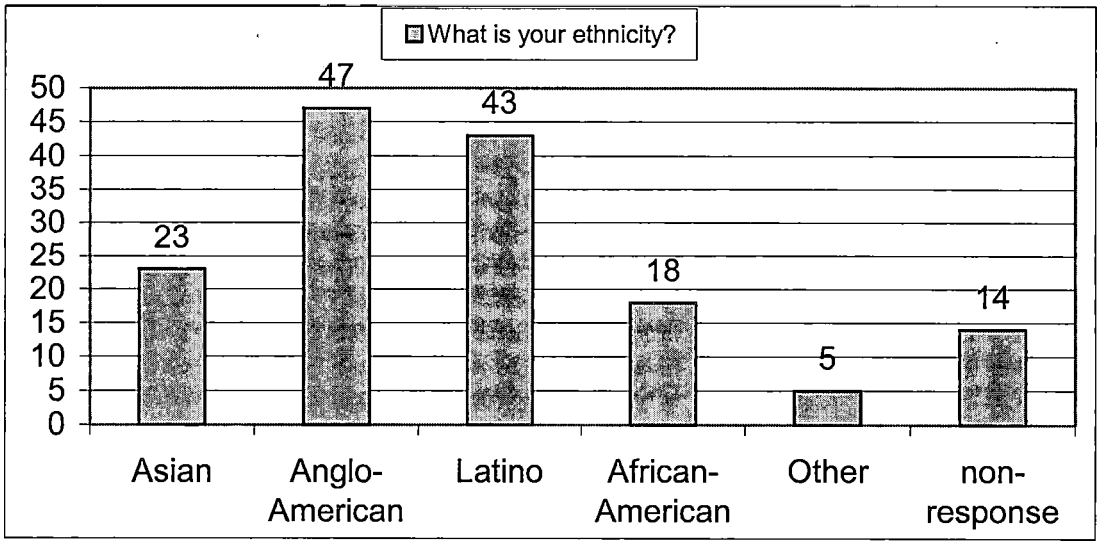
18. What category best describes your age?

What category describes your age?		
Age	Frequency	Percent
Under 15	7	4.49
15-24	35	22.44
25-44	54	34.62
45-49	38	24.36
Over 75	16	10.26
Total	150	100.00



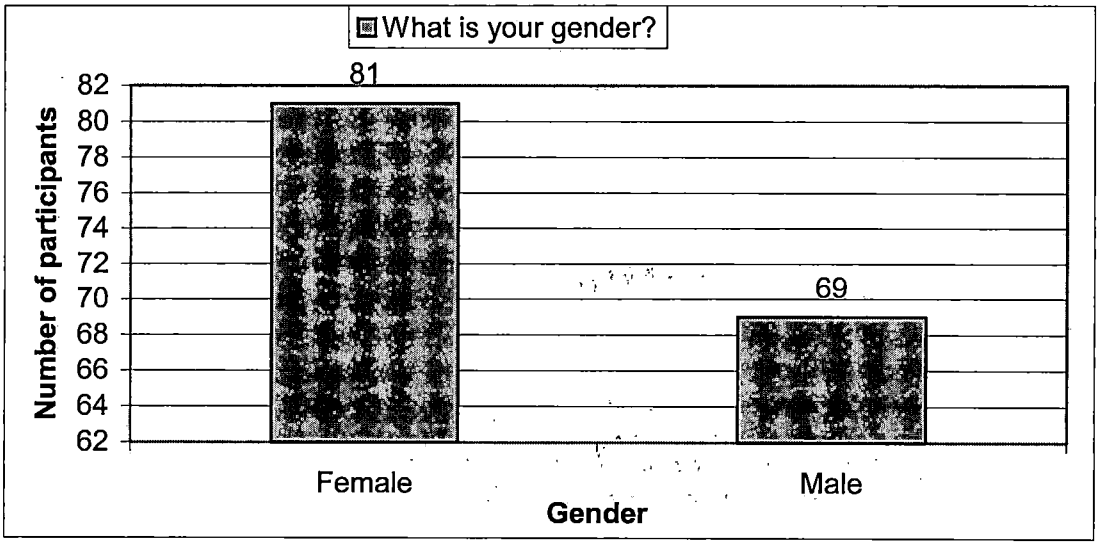
19. What is your ethnicity?

What is your ethnicity?		
	Frequency	Percent
Asian	23	14.74
Anglo-American	47	30.13
Latino	43	27.56
African-American	18	11.54
Other	5	3.21
Non-response	14	8.97



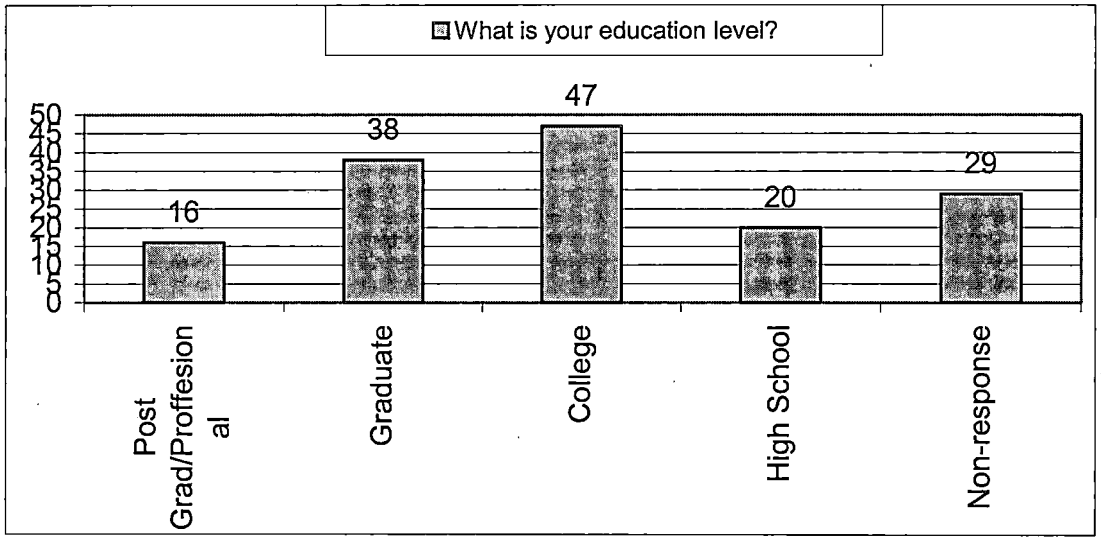
20. What is your gender?

What is your gender?		
	Frequency	Percent
Female	81	54
Male	69	46
Total	150	100



21. What is your educational level?

What is your education level?		
	Frequency	Valid Percent
Post Grad/Professional	16	10.67
Graduate	38	25.33
College	47	31.33
High School	20	13.33
Non-response	29	19.33
Total	150	100.00



APPENDIX B

QUESTIONNAIRE

INTERVIEWER: Jui-Yu Chien
INSTRUCTOR: Dr. Norton Marks & Dr. Eric Newman
SUBJECT: Graduate Project& Alternative Fuel Bus

The following survey is being conducted as part of a graduate project at CSUSB. The project centers on alternative fuel technologies, and I would like to ask you a few questions. Any response you give will be held in the strictest confidence. I only show summary results for all respondents. Please read carefully and circle the choices applicable to you.
QUESTIONNAIRE NUMBER_____ DATE___/___/____
DAY/ MONTH/ YEAR

1. Have you ever used a public bus or school bus for transportation?
   Yes 1
   No 2 (Terminate interview and thank respondent)

2. How often have you ridden the bus to travel?

Never	1	2	3	4	5	6	7	Very Often	No Opinion

3. For what purposes did you travel by bus?
   I ride the bus to go to work 1
   I ride the bus to go to school 2
   I ride the bus to visit friends 3
   I ride the bus to go shopping 4
   Others (Please Explain) 5 _____

4. Are you aware of the use of alternative fuel buses in public transportation? (Any other than diesel and gasoline)
   Yes 1 No 2 No Opinion 3

5. Could you please tell me what kind of alternative fuel buses you have heard about it?
   Natural gas 1
   (Including Liquefied natural gas and/or Compressed natural gas)
   Electric 2
   Hybrid electric 3
   Propane 4
   Methanol 5
   Others (Please Explain) 6 _____
   None 7

6. Could you please rate the efforts of the following organizational groups to promote the use of alternative fuel vehicles in transportation?

Federal Government.

Very Bad	1	2	3	4	5	6	7	Excellent	No Opinion

State Government.

Very Bad	1	2	3	4	5	6	7	Excellent	No Opinion

Bus Operators.

Very Bad	1	2	3	4	5	6	7	Excellent	No Opinion

State your agreement or disagreement with the following statements:

7. The use of alternative fuel buses to prevent air pollution?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

8. Bus fares and/or tax rates should be increased in order to buy alternative fuel buses for public transportation?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

9. The public should be encouraged to use bus transportation?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

10. There are enough mass transportation bus routes to travel to destination points?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

11. Mass transportation buses run often enough?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

12. Bus operators should no longer purchase diesel buses?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

13. Bus operators should stop operating diesel buses?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

14. I am very comfortable when traveling by bus?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

15. Diesel buses cause a lot of polluting effects?

Disagree	1	2	3	4	5	6	7	Agree	No Opinion

16. What kind of bus do you prefer to ride?

Large Size (40 feet)	1	Small Size (27 feet)	3
Medium Size (34 feet)	2	No Opinion	4

17. What kind of alternative fuels should the bus operators purchase in the future?

Natural gas (Including Liquefied natural gas and/or Compressed natural gas)	1
Electric	2
Hybrid electric	3
Propane	4
Methanol	5
Others (Please Explain)	6 _____
Don't know	7

18. What category best describes your age?

Under 15	1	60-74	5
15-24	2	over 75	6
25-44	3	Non-Response	7
45-59	4		

19. What is your ethnicity?

Asian	1	African-American	4
Anglo-American	2	Other	5
Latino	3	Non-Response	6

20. What is your gender?

Female	1	Male	2

21. What is your educational level?

Post Grad/Professional	1	High School	4
Graduate School	2	Non-Response	5
College	3		

Thank you for participating in this survey. I appreciate your time and efforts.

APPENDIX C

CROSS TABULATION AND

ONE-SAMPLE TEST

Table 1

Are you aware of the use of alternative fuel buses in public transportation? (Any other than diesel and gasoline) * Bus fares and/or tax rates should be increased in order to buy alternative fuel buses for public transportation? (Cross tabulation)										
		Bus fares and/or tax rates should be increased in order to buy alternative fuel buses for public transportation?								
Rating		1	2	3	4	5	6	7	No opinion	Total
Are you aware of the use of alternative fuel buses in public transportation? (Any other than diesel and gasoline)	Yes	6	5	2	11	7	13	46	1	91
	No	7	7	3	19	6	2	1		45
	No opinion	12				1	1		1	14
Total		25	12	5	30	14	16	47	2	150

Table 2

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Bus fares and/or tax rates should be increased in order to buy alternative fuel buses for public transportation? (Rating)	25.19042	150	1.51875E-19	4.602649007	4.241622927	4.963675
The public should be encouraged to use bus transportation? (Rating)	44.78985	150	1.51875E-19	5.754966887	5.501086369	6.008847

APPENDIX D

SUMMARY OF ALTERNATIVE FUEL VEHICLES AND FUTURE PROJECTIONS

SUMMARY OF AFVS AND FUTURE PROJECTIONS

This summary provides an overview of alternative fuel vehicle availability and development. The summary is largely based on a review of product information, reports, articles, program information, and news briefs available on the Internet.

The alternative fuel vehicles considered include electric, natural gas and propane, ethanol and methanol (flexible fuel vehicles), electric-hybrid, and fuel cell vehicles. The sections below present information on vehicle availability and developments for each of these types of alternative fuels vehicles. The following points summarize the findings for each vehicle type.

- Electric vehicles currently account for an extremely small share of the vehicle market. Proposed zero-emission vehicle (ZEV) standards in California and several other states in the Northeast have largely stimulated most activity in this market. Current technology electric vehicles do not offer the range and features that most consumers demand, particularly considering the premium prices these vehicles demand. While automakers seem to be replacing lead-acid batteries with more advanced batteries to improve performance, there is little evidence that batteries that offer the necessary performance for these cars to be competitive will be available before 2001. By then there are likely to be electric-hybrid vehicles available that offer the public superior performance. Furthermore, zero-emission fuel cell vehicles may be available as soon as 2005. The most interesting developments for electric vehicles seem to be in niche markets such as micro-scale neighborhood electric vehicles.

- Natural gas is a cleaner, more plentiful, and less expensive alternative to gasoline fuel. Advances in engine technology and fuel storage offer the potential for increasing the efficiency, performance, and range of these vehicles. Many of the vehicles available are bi-fuel (they also can run on gasoline), so they provide the opportunity for achieving low emission levels with the option of using gasoline when natural gas is not available. It seems that natural gas vehicles have a good future in fleet applications (particularly buses and large trucks), but for the mass market their future may be limited by the introduction of electric hybrid and fuel cell cars (which could be powered by natural gas).

- Flexible-Fuel vehicles using ethanol or methanol in the near term may be the most numerous alternative fuel vehicles available. These vehicles have market appeal because they are just like a regular car, cost no more than a regular car, and can use gasoline if an ethanol/methanol station is not nearby (which is likely at the moment). However, these vehicles offer little in the way of emission benefits relative to existing low emission gasoline vehicles outside of possible reductions in greenhouse gas emissions. Their main advantage is they can use ethanol, which is a locally produced fuel from renewable sources. These vehicles provide one tool for auto manufacturers to show they are trying to produce more environmentally friendly vehicles, but these vehicles clearly are not the way to get to the next generation of advanced, high efficiency, low emission vehicles.

- Hybrid-electric and fuel cell powered vehicles are clearly the future. This is where the industry is focusing its attention. These vehicles offer the potential of 3 times the fuel economy, several times the range, ten percent or less the emissions, and equivalent or better performance than today's vehicles. Hybrid-electric cars will likely be available in the US beginning in 2000 from Toyota and from the major three US automakers shortly thereafter. These initial hybrids will use internal combustion engines for their power source. The initial Toyota version uses a gasoline-powered engine, while the US prototypes use diesel engines. Fuel cell vehicles are expected to be available by 2005. These will be zero emission vehicles. There is some question as to what fueling infrastructure will be used to fuel these vehicles. It appears that initially some kind of liquid fuel like methanol or gasoline that can be dispensed by the existing fueling infrastructure will be used and reformed to hydrogen by on-board reformers.

Electric Vehicles

Table 1 summarizes the electric vehicles currently available from the major automobile manufacturers.

Table 1. Electric Vehicles

Vehicle	Range[1]	Battery Type	Cost[2]	Availability
Ford Ranger	50 - 58	Lead Acid	$32,950	National
Honda EV Plus	100 city/84 highway	Nickel-metal hydride	Lease: $455/month	CA
GM S-10 Pickup	40-60	Lead Acid	$32,795	CA & NY
GM EV-1	79	Lead Acid	Lease: $399 –549/month	CA & AZ
Chrysler EPIC Mini-van	60	Lead Acid	NA	CA & NY
Nissan Altra-EV Mini-van	120	Lithium-ion	NA	CA
Toyota RAV-4 SUV	118 (130/106)	Nickel-metal hydride	Lease: $457/month	CA

1. Note there are inconsistencies in reported ranges for these vehicles. The ranges shown may not be directly comparable.
2. Cost varies significantly depending on local incentives.

The market for electric vehicles is limited. The vehicles shown in the table have limited distribution. They are largely for fleet use in California. Typically they are offered on three or four year leases. GM plans to offer a two-year lease option for the EV-1.

A baseline study done by the Electric Vehicle Association of America in 1993 estimates there are 2,000 to 2,400 light duty electric vehicles on the road in the US (this excludes non-highway capable EVs, golf carts, neighborhood vehicles, etc.). The report showed Washington with 56 EVs, the sixth highest state. Sales of electric vehicles are still relatively small. In the eight months the EV-1 has been available in Southern California and two Arizona cities, GM has leased 215 of them. GM has also sold 200 of its electric pickup, the Chevrolet S-10. Sales are projected to increase dramatically as a result of ZEV standards in California and other states, although it is not clear when those standards or the threat of those standards will cause dramatically greater sales, particularly if the technology does not deliver what the market wants.

Many of the available vehicles are modified versions of existing gasoline-powered models with the exception of the EV-1 and the Nissan Altra.

There are a variety of other electric vehicles from secondary manufacturers that are either modified versions of existing production cars or unique originals. Planned improvements to the EV-1 include a 4-door version and the option for nickel-metal hydride batteries, which will increase the range of the EV-1 to 160 miles.

A number of manufacturers have prototypes of small neighborhood electric vehicles (including, Mercedes, BMW, Toyota, and Nissan). These vehicles are intended for local travel and have limited range and speed. They are two person, limited cargo area vehicles priced to sell in the $10,000 to $15,000 range. This may be a good future niche market for electric vehicles. Some examples of these new electric vehicles include the Toyota 2-seater E-COM that is supposed to be available later this year and Nissan's 2-seater Hypermini that debuted at the Toyota motor show. The Diamler-Benz Smart car (an I-C version) will be available in March 1998. This is a $9,030 2-seater designed for city dwellers. Apparently 20,000 people have already expressed interest in buying a Smart and they project sales could reach 200,000 per year. An electric version of the Smart car is planned and may be introduced in the US by 2003. An electric version of the Diamler-Benz A-Class car may also be introduced in the US by 2003.

Batteries are the key limiting factor on the performance and wider adoption of electric vehicles. It is clear from Table 1 that vehicle manufacturers are moving from lead acid batteries to more advanced nickel-metal hydride batteries. These advanced batteries offer up to twice the range and better cold weather performance. Manufacturers will need to adopt these more expensive, better-performing batteries to meet the needs of the market. This may require some manufacturer subsidies to meet ZEV sales requirements. Historically, improvements in electric vehicle efficiency have been achieved by improving the efficiency of electric drive train components and the integrated operation of the battery and drive train. Clearly, better performing advanced batteries than are available today are necessary for EVs to capture a significant share of the market. Projections suggest that these advanced batteries are not likely to be available in commercial vehicles until the 2002-2005 time frame. The delay in implementing the California ZEV standard is viewed by some as a setback for the development of more advanced batteries.

Natural Gas and Propane Vehicles

Table 2 shows the natural gas and propane vehicles currently available. Like electric vehicles, these cars and trucks are mostly aimed at the fleet market.

Table 2. Natural Gas and Propane Vehicles

Vehicle	Fuel	Range[1]	Emissions[2]	Cost[3]
Ford F-Series Pickup (Dedicated)	CNG	200-250	ULEV/ILEV (CA-SULEV)	$18,225
Ford F-Series Pickup (Bi-Fuel)	CNG/Gas	200 (CNG)	TBD – (LEV)	$18,225
Ford F-Series Pickup (Bi-Fuel)	LPG/Gas	300-400 (LPG)	LEV	NA
Ford Econoline (Dedicated)	CNG	100-200	ULEV/ILEV (CA-SULEV)	$21,900
Ford E-Series (Bi-Fuel)	CNG/Gas	100-150 (CNG)	TBD – (LEV)	$24,100
Ford E-Series (Bi-fuel)	LPG/Gas	250-300 (LPG)	TBD – (LEV)	NA
Ford Crown Victoria (Dedicated)	CNG	200	ULEV/ILEV	$23,600
Ford Contour (Bi-Fuel)	CNG/Gas	100-140 (CNG)	TBD – (LEV)	$19,930
Honda Civic GX (Dedicated)	CNG	220-245	ULEV/ILEV	$20,500
General Motors GMC Sierra and Chevy C2500 Pickups (Bi-Fuel)	CNG/Gas	NA	LEV	NA
General Motors Chevy Cavalier (Bi-Fuel)	CNG/Gas	100-150 (CNG)	LEV	NA

1. Vehicle range will vary depending on fuel storage option. The range shown is for CNG or LPG only.
2. TLEV – Transitional low emission vehicle; LEV – low emission vehicle; ULEV – ultra low emission vehicle; ILEV – inherently low emission vehicle; SULEV – super ultra low emission vehicle.
3. Cost will vary depending on fuel storage option and local incentives.

Chrysler plans to enter the market for natural gas vehicles in the fall 1998 with a Dodge Ram Van and wagons. These vehicles have improved fuel storage capacity (13 to 46% better) as a result of research with the Gas Research Institute. Chrysler claims these vehicles recover there first cost differential in the first year due to lower fuel costs.

General Motors has a prototype natural gas vehicle that has a 1.0L, 3 cylinder turbo-charged engine, that gets 60 mpg highway (gasoline equivalent), has a 400-mile range, includes a continuously variable transmission for smoother ride, and meets the Ultra Low Emission Vehicle Standard (ULEV).

One of the most successful uses of natural gas vehicles is for transit buses. A number of jurisdictions have converted to natural gas and have benefited from lower fuel and maintenance costs.

A limiting factor for widespread use of natural gas vehicles is the availability of natural gas fueling stations for public use. Most existing natural gas fueling stations are for fleet use.

Flexible Fuel Vehicles

Table 3 shows flexible fuel vehicles that are designed to run on methanol or ethanol and gasoline. These vehicles offered by Chrysler and Ford are a first level effort by automakers to make more environmentally friendly, lower emission vehicles. The production of alcohol fueled vehicles also provides auto-manufacturers with a significant credit towards meeting the corporate average fuel economy (CAFÉ) standards. These vehicles cost little more than a standard model (the Taurus FFV is available from any dealer in the country for $165 more than a standard model).

Table 3. Ethanol/Methanol Flexible Fuel Vehicles

Vehicle	Fuel	Range	Emissions
Ford Taurus FFV	Ethanol/Gas	250-350	Tier One
Ford Taurus FFV	Methanol/Gas	200-250	TLEV
Chrysler E85 Mini-vans	Ethanol/Gas		Tier One

Since 1990, there have been 23,232 FFVs sold in the United States; Ford says it sold 52 percent, or 12,117, of them. There are 15,000 methanol capable vehicles in the US according to the US Methanol Institute. Ford plans to build and sell 250,000 FFVs through the year 2001. Methanol is derived from natural gas. Ethanol is derived from corn and other grains and usually is sold as E-85, a mix of 85% ethanol and 15% gasoline.

Ford will offer a 3.0-liter-engine FFV Ranger pickup starting in fall 1998. Following that, Ford intends to offer other high-volume FFV car and truck lines, including its popular Windstar minivan.

One of the challenges for these FFVs is the availability of methanol or ethanol. However, due to the large number of E85 vehicles available from Ford and Chrysler in 1998, the number of ethanol stations is expected to grow rapidly, according to the National Ethanol Vehicle Coalition (NEVC). Stakeholders and DOE have drafted an action plan to promote the development and use of E85 refueling infrastructures. Copies are available for comment from the Clean Cities home page (www.ccities.doe.gov). Currently, 38 public and 29 private E85 stations are open and publicly accessible; seven more are under construction. Sixteen sites are under negotiation and 14 more are expected to open by the end of 1997. Another 81 are scheduled to open in 1998 and 1999 in the United States and Canada. Although refueling sites have all traditionally opened in the Midwest, stations are planned on the West Coast and along the Eastern Seaboard. Currently there are no stations in Washington. Four are planned in Seattle, Tacoma, Olympia, and Spokane (also Portland) in the 1998-1999 time frame. New sites cost $2,000–$55,000 depending on whether equipment is available or the site is a new installation.

Hybrid/Electric Vehicles

The introduction of the Toyota Prius in Japan was probably the biggest news in the alternative fuel vehicle arena for a long time. The Toyota hybrid is a parallel type hybrid with the electric motor used for acceleration up to about 13 miles/hour at which point the internal combustion engine takes over. The vehicle gets 66 MPG, has a range of 850 miles and is priced at $16,525. The car is comparable to a Toyota Corrolla. Its price is being subsidized by Toyota because they had a strong desire to be the first to market with a successful electric-hybrid vehicle. This vehicle went on sale on December 10, 1997 in Japan and in the first month had 3,500 orders. Sales for the vehicle are exceeding expectations. By the end of February, Toyota had delivered 2,000 cars and employees were working overtime to produce 1,200 per month. By June 1998 they hope to be up to 3,000 cars per month. Toyota plans to sell the Prius in the US by 2000. They boldly predict that by 2005 hybrid-electric vehicles will account for a third of the world auto market.

Most of the major manufacturers are also working on hybrid-electric cars. In the US there are several initiatives such as the Partnership for a New Generation of Vehicles, which intends to develop cars three times more efficient than today's models. This partnership involves Ford, GM, and Chrysler and a number of other partners. Their goal is to have these advanced cars in production by 2004. Examples of what these automakers are working on include:

- Ford is working on the "P2000" lightweight five-passenger car that is capable of 63 miles to the gallon. They expect to have a prototype hybrid-electric version on the road in late 1998 and a fuel-cell version by the year 2000. It weighs 40 percent less than a comparable Ford Taurus and uses an all-new, aluminum, 1.2-liter direct-injection diesel engine.

- Chrysler's new hybrid-electric vehicle gets 70 miles per gallon and produces about 50 percent fewer emissions. The aluminum-chassis, thermoplastic-bodied Dodge "Intrepid ESX2" is powered by an energy-efficient, 1.5-liter direct-injection diesel engine that works in tandem with electric drive motors and a small lead-acid battery pack. Its body is made up of six plastic pieces, versus 80 steel parts used in a standard model. The car weighs just 2,250 pounds, compared to 3,422 pounds for a 1998 Intrepid. While the ESX2 now costs $15,000 more to build than standard models, that's already $60,000 less than two years ago. Chrysler aims to cut costs even further in preparation for a year-2003 launch. While diesel engines can utilize up to 41

percent of the fuel's energy, versus 25 percent for gasoline, they also produce more nitrogen oxides and particulates. However, Chrysler claims the ESX2 is capable of meeting federal emissions standards.

- General Motors has both a parallel and series hybrid model built on an extended EV-1 platform. GM expects to have a production ready hybrid electric vehicle by 2001. For the series hybrid an electric motor drives front wheels and a gas turbine generator system and regenerative braking charges the battery pack. The vehicle gets 60-mpg highway using reformulated gasoline, accelerates 0-60 in 9 seconds, has a 40-mile zero-emission range and a 350-mile hybrid range. The parallel hybrid is billed as the world's first eco-friendly hybrid sports car. It gets 80-mpg highway using diesel fuel, has a 550-mile range, accelerates 0-60 mph in 7 seconds (faster than BMW Z3). An electric motor drives the front wheels and an Isuzu direct-injection turbo diesel drives the rear wheels providing all wheel drive.

- Mercedes, BMW, Mazda, Honda, Volkswagen, Volvo, Nissan (and likely others) are also working on hybrid-electric vehicles using fuel cells. These vehicles are covered in the next section.

Several automakers have partnered with fuel companies to develop advanced fuels for these advanced vehicles. Of particular interest is the development of diesel fuels that further improve efficiency and reduce emissions.

Hybrid-electric buses are also being developed. Calstart and AC Transit have put a 40-foot hybrid electric bus in service that uses a propane engine in series with a generator, nickel-cadmium batteries, and two electric motors. The bus has a 230 mile range; 40 miles in electric mode only. In August 1997 Toyota began selling a hybrid-electric mini-bus in Japan (21 and 24 person configurations) that has a 1500 cc gasoline engine in series with a generator, lead acid batteries, and an electric drive system. It has a range of 250-310 miles. The system produces 90 percent fewer hydrocarbon and nitrous-oxide emissions and 66 percent less carbon monoxide than gasoline or diesel buses.

Fuel Cell Vehicles

Fuel cell powered vehicles are simple extensions of the hybrid electric vehicles discussed above. The fuel cell replaces the internal combustion engine as the vehicle power source. Fuel cell powered hybrids will run in a series configuration where the fuel cell would generate electricity to charge the batteries and power the electric motors.

- Ford is projecting a fuel cell prototype of their P2000 hybrid-electric vehicle by the year 2000.

- General Motors projects production ready fuel cell powered hybrid-electric vehicles by 2004.

- Mazda is developing its own fuel cells. Its first fuel-cell passenger car, a converted Demio compact multi-purpose vehicle, was unveiled in December 1997. Rather than use a system that converts methanol or another fuel to hydrogen on-board, Mazda has focused on a system that uses compressed hydrogen and is exploring using an alloy for hydrogen storage. Mazda is now working to make its system smaller and on perfecting a device to humidify the polymer electrolyte membrane to accelerate the electrochemical reaction that creates electricity.

- Daimler-Benz intends to launch mass-production of its fuel-cell cars in 2004. By its third year of production, Daimler-Benz expects sales of 100,000 vehicles per year. A prototype unveiled in September 1997, the "NECAR 3," is refueled with liquid methanol that is dispensed as easily as gasoline. The methanol is converted to hydrogen for use by the fuel cell. This vehicle is built on the Mercedes A-car platform and is projected to have a 250-mile range.

- Diamler-Benz has also produced a fuel cell-powered transit bus and said it hopes to have 20 on the road by the year 2000. The "NEBUS," or "new electric bus," uses a proton exchange membrane (PEM) fuel cell designed by Ballard Power Systems. It's rated at about 250 kilowatts, or about 340 metric horsepower; 190 kW (260 hp) are used for the drive, electrical and air conditioning systems. Seven roof-mounted compressed hydrogen cylinders enable a range of about 156 miles. The 40-foot low-floor bus, a converted Daimler-Benz O405N model, seats 34 and has space for 24 standing passengers. Other

innovations include infinitely variable 75 kW asynchronous hub motors, an active electronically controlled suspension system and solar cells integrated into its roof vents.

- BMW will have a pilot hydrogen-car program operating in 1998 at a Munich airport and intends to mass-produce hydrogen-powered cars between the years 2020 and 2025. The company believes hybrid-electrics are an interim solution and the only real solution to global warming is hydrogen-fueled cars.

There is an intense interest by automakers in fuel cells and they are investing significant amounts of money into fuel cell research and partnerships. For example, Ford has announced a $420 million dollar partnership with Ballard Power Systems and Daimler-Benz to develop, sell and use fuel-cell power systems in electric vehicles.

Fuel cells currently cost about 10 times as much as an internal combustion engine. However, because these advanced vehicles require smaller engines and research advances are happening, it is expected fuel cells will be competitive in one to two decades. Diamler-Benz has said it will absorb the fuel cell price gap to make the cars more affordable and stimulate demand.

Perhaps the major question for fuel cell vehicles is what fuel they will use. There are essentially three approaches. The first involves using the existing gasoline infrastructure and using on-board reformers to convert the gasoline to hydrogen for use in the fuel cell. A second approach is to stick with a liquid fuel-dispensing infrastructure, but switch to another fuel like methanol, which is easier to reform than gasoline. These two approaches which use on-board reformers reduce efficiency, increase vehicle cost and reduce performance (the first even more so than the second). These two approaches tend to be favored by the US Department of Energy and US automakers because they do not demand an overhaul of the gasoline/fuel-dispensing infrastructure. The Diamler-Benz prototype uses liquid methanol. The third approach is to change the fueling infrastructure to provide hydrogen directly to the vehicle and do any necessary reforming off-board. This approach is the most efficient and results in the highest performance vehicle, but demands the creation of a hydrogen fueling infrastructure (note that hydrogen is a gaseous fuel). Companies like BMW and Mazda are favoring this approach in their research. Infrastructure constraints suggest that initial fuel cell vehicles will use liquid fuels.

Web Links

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Hybrid Electric Vehicle Program: http://www.hev.doe.gov

Partnership for a New Generation of Vehicles: http://www.ta.doc.gov/pngv/

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