Redefining the Market: Six Emerging Markets for Small Electric Vehicles

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Abstract

Conventional wisdom is that the market for mini-electric vehicles (EVs) is minimal and not profitable. However, there are changes in the global auto-market, such as rapidly developing international markets in very dense urban areas, new technology, changing demographics, new city planning, regulatory forces and consumer enthusiasm for certain electric vehicle attributes that may prove the conventional wisdom wrong. There are several emerging market places for practical use of small electric vehicles which have been identified and are being characterized and measured by researchers at the Institute of Transportation Studies at the University of California at Davis. These markets include taxi services and emerging middle class buyers in high density urban areas of rapidly developing countries, residents of gated communities, resorts, retirement towns, and new cities, urban electric vehicle markets in medium density cities of developed economies, neighborhood electric vehicles for multi-vehicle households, and station cars for mass transit systems.

Introduction

Despite rapid advances in technology, the market for electric vehicles is still unknown territory, full of both promise and risks. Recent demonstration projects have begun to prove the technology but have yet to demonstrate demand. Automotive makers are bringing out their first designs in the coming years, but are moving cautiously, aware of the good publicity electrics create but fearful of consumer disappointment. Small electric vehicles are a less certain territory, combining what many think are market weaknesses—smallness and battery electric propulsion. On the other side of the argument are visionaries who claim that these two factors, smallness and battery electric propulsion are the central strengths of these vehicles, creating a form of personal transport that solves most of the social ills brought by automobiles. These researchers point to trends, such as increasing congestion, tight parking, worsening air-pollution, rapidly growing car markets in dense Asian cities which have no room for large, thermal vehicles, and better electric vehicle technology; a set of indicators which point to small electric vehicle potential.

The research problem comes down to understanding under what conditions will markets for small electrics grow, and where and when will those conditions occur? In particular, the problem is characterizing a range of consumer, regulatory and infrastructure trends throughout the world. At U.C. Davis, we became interested in electric vehicles markets after the announcement of the Zero Emission Mandate in California in 1991. In particular, we became very interested in EV markets after we observed enthusiastic consumer response to rather modest EVs used in a test drive we conducted at the Pasadena Rose Bowl in 1992. At that test, we supplied methanol fueled, compressed natural gas fueled and electric vehicles to be test driven by 250 heads of households (Turrentine et al 1992). Until that drive test, our ITS-Davis group had been primarily interested in markets for Compressed Natural Gas vehicles. While we were not impressed by the technology of the EVs we borrowed for the test drive, we were impressed by the enthusiasm of a large portion of the participants for such modest electric vehicles. Their response contrasted to the lukewarm response of most respondents to the methanol or CNG vehicles. Their enthusiasm had three components: they found electrics fun to drive, electric technology was thought to be exotic, interesting and especially meaningful because of its zero emissions, and many of those interested in the EVs thought their lifestyles would fit an EV.

The enthusiasm we witnessed for EVs contrasted with the obvious practical limitations of EVs. Additionally, many studies of American household travel behavior indicated a sizable potential market for limited range vehicles, while other more conventional survey work offered rather dim predictions for EVs.[1] This paradox presented an interesting research problem, one which conventional market research appeared incapable of solving. Along with that first ever public drive test of EVs, we set about investigating EV markets from every angle we could imagine, developing new research approaches as we went, including interviews with pioneering EV enthusiasts (Kurani and Turrentine 1994), detail lifestyle interviews with multi-vehicle households in California (Kurani et al 1994) (Turrentine and Kurani 1996), focus groups and interviews with users of golf carts in retirement communities and households who used Neighborhood Electric Vehicles for one and two week trials (Kurani et al), a statewide survey of multi-vehicle households (Turrentine et al 1995 ; Kurani et al 1996). We have also been collaboration with researchers in France to compare market trends and consumer responses using methods pioneered at U.C. Davis (Lee-Gosselin et al 1996). Finally, we have ongoing projects, one with station car users in the San Francisco Bay Area and a new consortium of researchers investigating markets for electric propulsion in autos, two and three wheeled vehicles, as well as transit vehicles in rapidly developing economies.

Reviewing the conventional wisdom

The conventional wisdom about small electrics mentioned above is based upon two premises: first, that the North American car culture, especially the California car culture, is the general evolutionary direction in which automobile markets, worldwide, are developing, and that market is centered on familiar types of vehicles. The second premise is that profit margins diminish at the small car end of the vehicle spectrum, making small car markets a difficult context in which to introduce new technologies. These two premises are reinforced by the immediate world of the North American car culture. Everyday Americans drive to their daily appointments on crowded, dangerous, fast moving freeways with trucks and large cars; it is hard to imagine that small vehicles

[1] W discuss previous work and this paradox in several previous papers. See for example, Kurani et al 1994.

of any type can or even should share these essential routes to and from daily appointments.

The experience of North American car companies has been that small vehicles are not profitable. By contrast, sales figures for large, gas-guzzling sports utility vehicles in North America have been the hottest, most profitable markets in recent years. The marginal costs of producing large vehicles is not great, while profits are better. Sales and profits shrink rapidly at the small vehicle end of the market. Moreover, there are only a few points in automotive history when new technologies were introduced in small vehicles, an exception is the Honda CVCC. Typically, new technologies have been sold in higher priced vehicles to absorb research and development costs.

Markets beyond North American are different, and the sales of small vehicles in most other countries are much greater. The reasons are many: household incomes in these economies have lagged behind the North American economy, these countries have charged high gas taxes, and their older, more dense cities have greater parking and road size limitations. These variables have kept car size down. Asian markets also have smaller cars, and there is great interest among car makers to sell small vehicles to meet the aspirations of rising middle classes in rapidly developing areas of Asia. These new middle classes do not yet have the disposable income for anything other than basic vehicles.

Adding the new technology, uncertainty, and limitations of electric vehicles to this weak market of small cars in North America, lukewarm market of small cars in Europe, and new markets in Asia may seem foolhardy. Finally, to this already uncertain ground of small electric vehicles we add "new concept vehicles" like non-freeway capable neighborhood electrics; and shared ownership concepts such as station cars. Such vehicles are found currently in only a few specialized communities, like golf carts in retirement communities, or electric vehicles wheeling around in airports and factories. There are so few of these situations they are hard to envision as significant markets. To many in the auto business, who wish to devote themselves to markets with millions of buyers, these are not inspiring market segments.

The challenge to conventional wisdom

However, following conventional wisdom could be a serious error. We are in a period of rapid technological and social change. Pollution, traffic, car related injuries and fatalities, fuel security and other sins of the automobile are found in varying combinations and intensities throughout the world. Automobiles appear to many planners and as an non-sustainable technology, requiring serious technological and regulatory fixes. The car-based suburban-lifestyle has lost much of its luster in recent years and efforts are underway in both high growth and mature markets to moderate auto use. Cars and traffic are a source of stress. Where possible, planners and developers are trying to limited auto use to improve lifestyles—revitalizing walking areas, upgrading transit, and charging heavily for parking. In some cities, planners are purposefully making it more difficult to use cars, creating visual and physical barriers to slow down traffic.

There is, however, little doubt—outside of draconian controls—that as long as automobiles are affordable, they will play a central role in lifestyle choices of households and individuals throughout the world. The sales of vehicles will continue to rise as long as incomes rise. Global culture and global auto markets go hand in hand. As traditions continue to erode in rapidly developing countries, and individuals are disembbeded from traditional settings, these persons must formulate their own identity

and lifestyle plans. The automobile will continue to be a central technology to achieve those goals.

Small electric vehicles are poised to take the middle ground; providing personal transport with the fewest social costs. Small electrics preserve personal mobility, yet promise some reductions in space used, lower speeds to make pedestrians safer, produce no curbside emissions and less noise. The technology finally exists to produce small and safe electric vehicles, with adequate range, power and amenities, especially in a supportive infrastructure context. It is still uncertain at what price these types of vehicles can be produced.

While small electric vehicles will have trouble competing on a level playing field with larger, thermal vehicles in the normal North American marketplace, indicators are the marketplace of the future, particularly outside the United States and in specialized locations in North America and Europe will be far from level. Facing increasing demand for automobiles and inability to raise funds for expensive transit, Transportation Demand Management and air pollution control districts throughout the world will see small electrics as a ideal compromise. Even hybrid electrics will be viewed as an inferior choice by many agencies because of long idle times and slow travel speeds in most mega-cities. Regulations, taxes and infrastructure developments in the future will favor small and electric vehicles over other options. The taxes and regulation of conventional vehicles in some countries such as Netherlands, Denmark or Singapore are already so extreme, that if regulators wish, small electrics can be offered at large discounts.

Given these trends, we are in a period of redefining the automotive marketplace; it is more global, more urban than suburban, more regulated, and with new technological capabilities that did not exist ten years ago. These trends are mutually supportive and can accelerate each other; together they will open the door to sizable new markets for small electric vehicles.

New markets for small EVs

Entrepreneurs dream of markets which are like wildcat oil wells, gushers which erupt once you drill into them. But most markets need to be primed and pumped. Small electric vehicle markets will require more patience, because they will most often depend upon the growth of regulatory forces such as increasing gas taxes, and incentives such as zero emission vehicle tax credits and infrastructure such as charging locations, dedicated roads and preferred parking. Such markets will grow in short spurts, as price thresholds are crossed, regulations enacted and infrastructure developed.

The design of small electrics will vary according to range, speed and amenities. There are regions in the United States where non-freeway (60 km/pH), short range (60 km) electric vehicles are impractical, while in some other regions of the world, vehicles never go more than 40 km/pH or 40 km/day because of road conditions and traffic. Some markets will require vehicles with all the amenities of a luxury auto while other markets will require the most simple vehicles. Ranges also will vary greatly, and because of the high price of batteries, marketing plans must offer a variety of ranges to capture more market

Below I list a set of emerging markets for small electric vehicles. My colleagues and I at U.C. Davis have been collecting baseline data, conducting surveys, interviews and test

drives with the public in these markets in order to measure and characterize the potential success of such markets.

1. Taxi service in high density urban areas: Small taxis make up sizable percentage of the automotive fleet in very dense cities throughout the world. The travel demands of small taxis in these dense cities are amenable to electric vehicle ranges. These taxis are an easy target for regulatory controls; in many cities throughout the world, taxi drivers have been forced or encouraged to adopt alternative fuels.

2. Emerging middle classes in high density urban areas: The areas of most dynamic growth in the auto market have moved to rapidly developing economies, particularly in Asia and Eastern Europe. Some of these areas have experienced double digit car sales growth as well as double digit motorized two wheeler sales growth for many years. Because of high density population in these cities, there will be more severe regulation and planning of automobile culture than has been experienced in North American cities. Singapore and Hong Kong have set the pace in regulating cars. U.C. Davis in collaboration with Lawrence Berkeley Laboratories has developed a new research consortium to measure and characterize these markets.

3. Urban electrics in medium density cities: Regulatory forces for pollution and limited parking will encourage small electric vehicles in medium density cities such as Toronto or Paris. In particular, there will be medium sized tourist oriented cities, wishing to promote themselves as progressive and healthful, who will encourage EVs. Markets will be quite different city to city depending on many local variables, such as parking availability, density, traffic speeds, and special purpose roadways.

4. Gated communities, resorts, retirement towns, and new cities: Affluent senior populations throughout the industrialized world, demand for better neighborhood security and post-traditional lifestyles have lead to rapid growth of these specialized communities. Resort communities and some retirement centers, especially those with golf courses, have fostered golf cart use, both electric and gasoline types as a easy and fun way for residents to get around. Focus groups and surveys by U.C. Davis showed that these communities will continue to improve infrastructure, increasing the market. These types of voluntary communities are able to exert greater regulatory control over residents than other types of communities: some may require use of small electrics. Alternative licensing for seniors may favor non-freeway electrics. Better technologies and increasing health and environmental sensibilities of subsequent generations will favor small electrics with supporting road infrastructure in these types of communities.

5. Neighborhood electric vehicles: Some multi-vehicle households, (what we have called hybrid households elsewhere) in many suburban areas with amenable road infrastructure (outside of the specialized communities listed above) will find small, non-freeway capable electric vehicles practical additions to their household vehicle fleets. Regulatory forces such as reduced off-street parking requirements for homes, businesses and commercial parking lots will encourage small electrics. Up to 5% of multi-vehicle households in a recent U.C. Davis market survey selected a non-freeway neighborhood electric vehicle for their next vehicle purchase.

6. Station Cars and Instant Rent-a-Cars: Transit systems in medium to low density urban areas will try to increase their ridership by offering low cost, easy to use electric vehicles at terminals. Transit systems may join with local communities to

promote use of smaller vehicles. U.C. Davis is currently working with the National Station Car Association and the Bay Area Rapid Transit District to evaluate consumer response, air quality and energy benefits of station cars in their present demonstration project.

These six markets above are the primary opportunities for small electric vehicles. They are not wildcat markets but slow growing. Such vehicles must fit lifestyles needs and road environments. As noted in each case, regulatory forces form a significant aspect of the demand for such vehicles, tilting markets in favor of these vehicles. Nevertheless, remember that a significant number of participants in drive tests think such cars are fun and offer new meaning, status, and excitement to their lives, the stuff which has always sold lots of cars.

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