From the Top of the Organization to the Bottom Line: Understanding the Fleet Market for Plug-in Electric Vehicles

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ABSTRACT
Government and commercial fleets are widely targeted as an ideal market for plug-in electric vehicles (PEVs). However, the reasons are often based on misconceptions regarding past purchases behavior and misunderstood operational considerations (1). PEVs do have attributes that are valued by organizations, as we learned from drivers, fleet managers and company decision makers who had the opportunity to drive a PHEV for more than a year. In this paper we discuss how the perceived value of the PHEV varied depending on the employee’s responsibilities and role in the organization. We also report on the primary concerns expressed by the project participants regarding the purchase and use of PEVs. These findings provide a better understanding of fleet vehicle purchase priorities and operational considerations that could affect development of the PEV fleet market. Given the varying importance assigned to different PEV attributes by employees throughout the organizational structure, we propose that PEV marketing campaigns look beyond the one individual tasked with purchasing vehicles. A more effective, robust market strategy requires targeting several people within an organization.
INTRODUCTION

Government and commercial fleets can play an important role in advancing the plug-in electric vehicle (PEV) market. In 2011, these fleets accounted for more than 750,000 light-duty cars and trucks sold in the U.S., accounting for approximately 6% of the light-duty vehicle market (2). However, PEV sales to these fleet markets are disproportionately low compared to the private household market. In 2013 only 2.6% of all PEVs sold in California were to commercial proprietors or public entities (3). If PEVs are to capture a more significant share of the fleet market, it is necessary to understand how vehicles are used in fleets, how fleets purchase those vehicles, and what PEV performance characteristics are valued most by organizations that operate fleets. Only then can appropriate policies, pricing strategies, and marketing approaches be developed to support the incorporation of PEVs into fleet applications.

This paper reports the key values and considerations regarding fleet purchase and use of PEVs as identified by participants of a PEV demonstration project. Participants identified four main areas where PEVs can provide value to their organization. These include:

• Reinforcing brand and image
• Improving driver experience and convenience
• Reducing fuel costs
• Meeting sustainability goals

However, our results show that these values are typically prioritized differently by personnel depending on their position and job function within the organization. CEOs, sustainability officers and marketing directors are typically the ones most concerned with image and sustainability goals; drivers want good driving characteristics and convenience; and fleet managers value fuel cost savings. While organizations participating in the demonstration project found significant value associated with the adoption and use of the PEVs, fleet managers and vehicle users reported some key operational and procurement issues which could hinder the purchase and full utilization of PEVs. We generalize user concerns into three categories:

• Lack of available task-appropriate vehicles
• Installation and use of chargers
• Restrictive vehicle purchase criteria

This study provides insights into some of the most important factors which will affect the rate at which PEVs advance into the fleet sector. Results suggest the need to depart from conventional fleet vehicle marketing tactics in favor of adopting broader strategies that engage multiple actors within the organization (not just fleet managers). This important change is necessary to reveal the full value of PEVs to an organization. Likewise, several individuals may need to be engaged to address the challenges that can accompany PEV adoption which
include company policies regarding vehicle purchase criteria, associated infrastructure placement, and limited PEV model availability.

PROJECT DESCRIPTION

As part of an advanced vehicle technology demonstration project sponsored in part by the US Department of Energy, with funds from the American Reinvestment and Recovery Act (ARRA), Chrysler Motor Company designed, built and deployed a fleet of experimental Dodge RAM 1500 crew cab 4x4 plug-in hybrid electric vehicle (PHEV) pickup trucks for field testing. The 140 vehicles were deployed strategically across the U.S. with the intention of gathering in-use vehicle data relating to a variety climates, terrains and fleet use patterns. Researchers from the University of California, Davis assessed vehicle performance and driver experiences with twenty-eight of the RAM 1500 PHEVs deployed to fleets in San Francisco and Sacramento.

The vehicles were deployed in a multitude of applications from August 2011 to September 2013 for the primary purpose of transporting people and equipment. The driver’s roles within each of the organizations varied but included fleet managers, work crews, and organizational decision-makers. Many of the vehicles were assigned and used by only one person while others were shared, to various degrees, among multiple drivers. All the drivers were volunteers who were comfortable driving a large pickup truck; many had a pickup truck in their household.

Vehicle Description - The Ram 1500 PHEV

The full-size, blended-mode PHEV pickups, built on the Ram 1500 quad cab platform, were equipped with a 12.9 kW-hr Li-ion battery capable of being fully charged in 2-3 hours at 220V. The battery and motors operated in tandem with a 5.7L HEMI V8 400 HP engine, but under light throttle the PHEV was capable of all-electric operation up to about 35 miles per hour. Chrysler specifications stated a fuel economy of 32 mpg in charge depleting mode with an all-electric equivalent range of 20 miles. The vehicles had regenerative braking, a multi-screen human-machine interface (HMI) display, and 6.6 kW of on-board auxiliary power available through several 120V and 220V receptacles (located in the truck bed and cabin). The truck was also capable of meeting the ATPZEV emission standards which would make it eligible for a High Occupancy Vehicle (HOV) exemption sticker in California where the 28 PHEVs were operated. Equipment and material transport was limited because a portion of the pickup bed was forfeited to accommodate test instruments.

Data Collection and Analysis Methodology

Between August 2011 and May 2013 researchers conducted multiple interviews with the 53 PHEV demonstration drivers at their respective workplaces. These interviews provided insight into how the demonstration PHEV was used in the
context of the fleet and the conditions surrounding the implementation of the vehicle. Interviews with participants lasted about an hour each and were organized to allow participants to freely share their experiences. This provided participants the opportunity to discuss what features and attributes they valued most about the vehicle and why they valued them. Interviews were followed by an online questionnaire to further explore issues that could impact PHEV sales. In addition, vehicle use and performance data was collected directly from the 28 PHEV pickups. This data included more than 70 signal values recorded at sub-second intervals. The data stream included time and date, gasoline and electricity consumption, speed, mode of operation (CS vs. CD), ambient temperature, auxiliary power usage, air conditioning power use, charging energy and duration, continuous battery state-of-charge (SOC), and GPS vehicle tracking.

We draw on all three of these data sources to construct a narrative for each vehicle user. Thematic analysis was used to identify themes from each narrative, which were then grouped by interviewee job responsibility.

RESULTS
Reinforcing Brand and Image

Vehicle fleets are widely considered a necessary cost of doing business but PHEVs provide an interesting value proposition. They offer an opportunity to enhance public relations and reinforce company culture. Companies like to be seen doing the right thing, making a statement, setting an example, and distinguishing themselves from the competition. However, company branding is not typically a job performance metric for fleet managers who are pre-occupied with the day-to-day travails of keeping vehicles running at minimum cost. Yet, most efforts to market PHEVs to organizations start and end at the fleet manager level.

Aiming higher up the organizational chart and touting the image benefits of PHEVs may prove more effective. Previous research shows that high-level decision-makers value image benefits more than economics when considering alternative fuel vehicle purchases (4). They feel more of an obligation to support efforts to promote their company image and foster public relations. As decision-makers in the demonstration put it:

“We’re part of a city wide plan to reduce our departmental emissions - and I think my job is to support the department and city”

“Doing what we can is important to show support for the mayor and city policies”

Drivers and fleet managers did support environmental actions and 83% of our survey respondents thought “PHEVs improve the image of their organization”. Drivers even took pride when interfacing with the public and sharing information about the PHEV. They were good ambassadors of the technology and proud of
their agency. In fact, 80% of the survey respondents stated that they wish they had more information to share with the public. However at the fleet level, financial constraints often make it difficult to align attitudes about corporate image with purchase behavior. This “attitudes-behavior gap” (5) was evident among participating fleet managers.

Top level administrators see the bigger picture. They are willing to accept much longer PHEV payback periods because non-economic benefits continue to accrue to the company long after the financial return on investment is fully realized. Unlike the fleeting recognition resulting from awards and public acknowledgements, PHEV vehicles are on the road everyday attracting attention and enhancing corporate image. Attitudes about image benefits were best summarized by two decision-makers:

“We did a lot of PR stuff with the truck... took some pictures and got it put in the government fleet magazine..... We were the number two green fleet last year...we are trying to be number one this year.”

“The unofficial catchphrase of our department is ‘clean and green’. If we clean our fleet I think that’s a good PR message to send”.

Fleet PHEVs can also bolster corporate culture and signal a sense of social and environmental responsibility. Individuals recognize and consider corporate cultures when they look for employment opportunities. One survey found that 60% of full-time workers consider an employer’s impact on the environment vital when evaluating whether to work there (6). Conversely, businesses are proud of demonstrating environmental stewardship and welcome like-minded individuals. When employees feel their company is actively involved in environmental causes they also feel like they are a part of something significant which in turn can boost morale and efficiency. In a survey of 3000 U.S. businesses, 44% of human resource personnel stated that employee morale was the most valued outcome of their company’s environmental program (7). High-tech industry companies we interviewed tell us that investing in PHEVs conveys the right corporate culture which is important when recruiting and retaining highly-skilled labor in very competitive markets (8).

Improving Driver Experience and Operational Efficiency

Driving Characteristics

Drivers were overwhelmingly impressed with the demonstration PHEV performance. However, the luxurious nature of the vehicle, especially compared to their normal work vehicle, was very important when shaping initial impressions. Comforts and amenities like the high-end media unit, ergonomic adjustments, automatic back window, comfortable seats, cruise control and spacious crew cab were some of the most appreciated features. As one driver explained, in their normal work vehicles they are “lucky to get FM [radio]”.

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However, there were also inherent PEV operational characteristics that were touted by nearly every driver. They liked the quietness when operating in electric mode and the fact that there was no engine idling when stopped. Most were impressed with the power and acceleration noting that the truck had “tons of power” or could really “get up and go”. Drivers were surprised that a HEMI engine – an icon of power and high performance – was incorporated into a PHEV which many expected to be “sluggish” or “like a golf cart”. The HEMI engine seemed to lend instant credibility to the demonstration vehicle, as users felt like there was no performance trade-off for using a cleaner vehicle. As one participant put it, “it’s an electric vehicle but the HEMI is there when you need it”. In many cases, the HEMI engine helped sell the PHEV technology to the drivers.

Other driving characteristics commonly expressed include reduced vibration, more stability, less bed bounce, better weight distribution, improved handling, reduced road noise, and a smoother ride. Many mentioned the smooth transition between charge-sustaining (CS) and charge-depleting (CD) modes. The one concern frequently mentioned was a slight but noticeable “lag” when accelerating from a complete stop, although most of the drivers said they “got use to it”. Finally, drivers told us of a positive feeling they got while driving the PHEV. As one interviewee put it:

“Talk about the things that make you happy... when I am in electric I am happy. It feels good to be in electric and not using the fuel.”

On-board Auxiliary Power

One unique design aspect of the demonstration vehicle of particular interest to designers was the onboard auxiliary power (OAP) unit. The OAP unit consisted of two 110V duplex outlets (20 amp, standard NEMA) and a 220V outlet (30amp) all located on a power panel accessed through the side storage box on the passenger side of the vehicle. The OAP was capable of providing 6.6 kW continuous AC power. Overwhelmingly, drivers and fleet managers stated that the auxiliary power panel was a valuable feature for work purposes and an intriguing option for personal vehicles. Survey responses support these interview findings (Figure 1).
Onboard auxiliary power is an unfamiliar technology that fleets have difficulty understanding and evaluating. As with many unfamiliar, new and discontinuous innovations, there was considerable uncertainty when trying to predict the OAP’s future utility, even after having experienced it (9, 10, 11). As one fleet manager put it:

“Quite honestly, I don’t think we have actually thought about all the ways it could help us. If we really sat down to think about how we use a generator, I think we would find all kinds of ways it would be beneficial to us.”

This was further highlighted during the demonstration when one participant conveyed his excitement about a forthcoming opportunity to use the AOP but on the day of the event “forgot” the demonstration vehicle had auxiliary power available.

Convenience and time savings were cited as the main benefits by those who did use the OAP on a regularly basis. Users appreciated the freed up truck bed space or not having to tow a trailer for generator transport. One participant who used the OAP unit on a regular basis detailed the convenience of it. She did not have to make a trip to the utility yard to pick up a generator and then solicit a fellow employee to help her load it into the truck and unload it at the site. The OAP unit allowed her to perform, single-handedly, what was otherwise a two-person task.

Participants also valued the OAP as emergency response equipment, even though usage would be very infrequent. Other stated benefits include the fact that loud, high-polluting generators could be replaced with clean, quite energy while fostering good will with the public and allowing extended work hours in places with strict noise ordinances. However, it was also pointed out that an OAP takes the whole vehicle out of service, whereas a generator can simply be left at the job site. Such trade-offs need to be fully understood by prospective PHEV buyers in order to make an informed purchase decision.

Figure 1: Onboard Auxiliary Power Valuations by Survey Respondents

Onboard auxiliary power outlets are valuable for work; could replace a portable generator at work; new car buyers would purchase for personal use.
One PHEV fuel economy implication nearly every driver and manager stated was the benefit of fewer trips to the gasoline station. Drivers in San Francisco were especially appreciative because of the limited number of contracted fuel facilities throughout the city. Gasoline refueling often required an out-of-the-way trip during rush hour followed by a long wait to take a turn at the pump. Drivers and managers noted the convenience and time-savings resulting from fewer trips to the gasoline station.

This attribute could provide a significant economic benefit. In Manhattan, gasoline stations are so few and the lines so long, that FedEx pays employees overtime to refuel after work hours. These associated refueling costs are now even included in their return on investment (ROI) calculations, to the benefit of PEVs (12).

High Occupancy Vehicle (HOV) Lane Access

Although the demonstration trucks did not have HOV stickers, some of our interviewees pointed out this potential convenience benefit (based on emission test results, the demonstration PHEVs would be eligible for an HOV sticker). HOV access not only reduces travel time, it can also boost driver morale by mitigating traffic congestion experiences. One driver who anticipated this benefit exclaimed:

"As soon as I get stickers on the Focus EV, I will probably start driving that for my commute home, I get off just passed where the carpool lane ends. It's awesome!"

HOV stickers can reduce work-related travel times but also provide a potential benefit to employees. Those allowed to take work-vehicles with HOV stickers home could benefit from reduced commute times and less commute-related stress. The assumption being that happier employees are more productive and reduced travel times mean they spend more time at work. This benefit is recognized by one high-tech company which subsidizes employee HOV compliant vehicles up to $250 per month (13). As their CEO explained:

"The math works out. We have a lot of talented and highly paid people who waste time in traffic. So if we can save them a half hour a day, and many of them save more than that, then it very quickly adds up to more than what we pay per car every month." (Phil Libbons, Evernote CEO).

Survey responses show the majority of demonstration participants felt that paying for the home electricity to charge a PEV, in exchange for HOV lane access during their commute was a fair and acceptable trade off. However, those who already commuted in a work vehicle were less inclined to accept such a trade-off.

Reducing Fuel Cost
Beyond vehicle comfort, fuel economy was the factor most often cited by participants when evaluating vehicle performance. Participants often drew PHEV fuel economy comparisons to their normal work vehicle. However, fuel economy is a function of many variables including vehicle technology, driving cycles (e.g., stop and go vs. long freeway trips), driving style (e.g., aggressive drivers vs. efficient drivers) and the fuel used (total electric miles vs. gasoline miles).

Driving data from the PHEVs suggest that the potential for fuel savings is substantial but can vary significantly. Although fuel cost is only one component of a vehicle’s total lifecycle cost, it is important to fleet operators. Gasoline prices are very volatile which complicates budgeting. Fleet managers explained to us that more predictable fuel costs would help them project operating costs and stay within allocated budgets.

Figure 2 shows actual average fuel economies for each of the demonstration vehicles over a month period and compare it to the EPA ratings for a gasoline Ram 1500 of the same vintage (model year 2012). As can be seen, the PHEV demonstration vehicle significantly outperformed a gasoline Ram 1500 for both the San Francisco vehicles (more “city” driving demands) and the Sacramento vehicles (more “combined” city and highway driving).

Using the EPA 2012 Ram 1500 “city” standard of 13 mpg as baseline for San Francisco and the EPA “combined” standard of 15 mpg for Sacramento, the estimated monthly gasoline savings for San Francisco and Sacramento are 133.7 gallons (for 5654 miles) and 245.4 gallons (for 13,843 miles), respectively. Fuel economy results from the demonstration should be viewed cautiously as representative of what is technologically possible because there was little or no incentive for fleet vehicle drivers to drive in an eco-friendly manner or to maximize charging. There was also no concerted effort to place the demonstration vehicles in applications where the full fuel economy benefits could be realized.

To illustrate the importance of charging, we compared several weeks of CD fuel economy to several weeks of CS fuel economy when the vehicles were not charged, and therefore operated only in CS mode (4 vehicles did not experience long periods without charging). This comparison shows operation in the two modes over similar drive cycles (i.e., CS mode is not relegated to longer trips after the battery is discharged). The average fuel economy during these trial periods was 14.2 mpg (CS mode) versus 21 mpg (CD mode) in San Francisco and 17.2 (CS mode) vs. 23.7 (CD mode) in Sacramento (Figure 3). On average the vehicles used 38% - 48% less fuel while operating in CD mode during the comparison periods.
Figure 2: On Month of Fuel Economy Data

Figure 3: CS vs. CD Fuel Economy Over Similar Drive Cycles
Meeting Sustainability Goals

Decision-makers in various San Francisco departments discussed vehicle purchases in the context of the city’s clean air vehicle replacement guidelines. Enforced by the department of the environment, the guidelines require all city vehicles (except for law enforcement and emergency response vehicles) to be “clean air” certified unless there is compelling justification. One manager explained it this way:

“The city, in regards to going green, has taken a very hard line with what we can purchase. And if they know there is an alternative fuelled vehicle available to purchase and you have asked for a standard fuelled vehicle then you have to have an excellent justification as to why...we are not given a choice.”

In addition to requiring the purchase of clean air vehicles each city department has to complete an annual climate action report detailing the sources and quantity of their greenhouse gas emissions. The report provides targets and specific strategies to mitigate greenhouse gas emissions. Enforcement of the clean air replacement vehicle mandate and obligations of meeting climate action plan goals are shaping the purchase behavior of San Francisco city fleets. They follow developments in clean air vehicles and technology to find the best vehicles to meet their needs. As one manager explained: “Every year [when doing the budget] we talk about, are there electric vehicles available? Are there alternative fuelled vehicles available that we can load up for our application?”

Department managers, sustainability officers and others tasked with implementing these policies viewed the RAM PHEV as valuable because the PHEV technology, in a work truck format, could be a way to provide appropriate and flexible clean air vehicles for their staff. In fact, many fleet operators explained that one reason they elected to participate in the demonstration project was to evaluate the PHEV technology to inform future purchase decisions.

The extent to which the PEVs will likely be valued for sustainability reasons depends on the organization’s commitment to sustainability, environmental stewardship, or petroleum reduction goals. In the US, there are several cities, counties and states which are implementing climate change mitigation measures. Thirty-two states and over 200 cities have climate action plans of varying requirements. For example, in California local governments are required to develop climate action plans to meet greenhouse gas emission targets set in collaboration with the California Air Resources Board. These organizational goals are not unique to government fleets. Many companies have also been advancing sustainability programs and even specifically targeting vehicle fleet electrification.

The extent to which these organizational goals are pursued and linked to the organization’s fleet will undoubtedly contribute to the importance of PEVs. Such organizational goals add value to PEVs and can influence fleet vehicle purchases, if the right decision-makers get involved.
Considerations Associated with Using PEVs in Fleet Applications

The PHEV demonstration project provided participants with the opportunity to evaluate how a particular plug-in hybrid truck might function within their fleet. Participants also took the opportunity provided by the demonstration to assess conditions under which vehicle electrification might make sense. Interviews with project participants showed that, despite the benefits of PHEVs, certain issues must be addressed before PHEVs could be adopted on a large scale by their organizations. Even then, some fleet vehicle applications, such as law enforcement pursuit vehicles, may not be conducive to electrification based on drive cycles or vehicle performance requirements. We describe these considerations and conditions reported by our users in the context of three themes: green vehicles must be task-appropriate; an appropriate charging network must be installed; and the fleet vehicle purchase process must not inhibit PEV acquisitions.

PEVs Must Be Appropriate for the Fleet Assignment

Fleet managers who participated in the demonstration consistently stressed the importance of purchasing “green vehicles” but also emphasized the fact that the vehicles had to meet the needs of their job functions. As one participant noted, “At the end of the day the job needs to get done...whether it’s electric or gasoline, it’s just got to happen”.

The fleet managers we interviewed as part of this demonstration described their placement of the RAM 1500 PHEV as part of a strategic decision-making process which was not representative of how they normally assign fleet vehicles to drivers. Our fleet managers reported trying to select trustworthy and appropriate drivers who had job functions which could be met by the RAM 1500 PHEV. The large vehicle size, limited bed space, and inability to modify the vehicle in any substantial way meant that some fleets were un-able to use the vehicle within their normal “work truck” fleet. Fleet managers who had experience with compressed natural gas (CNG) vehicles described similar challenges they’ve faced incorporating CNG conversion pickup trucks, into their fleet.

The option of installing aftermarket components is also important to fleet managers. As one fleet manager put it “any vehicle we purchase will have to be modified to accommodate tool boxes, ladders and enclosures”. Fleet managers also noted the forfeiture of pickup bed space (because of the instrumentation box) was a problem. “Because of that box in the back it’s not conducive to being a work truck”. Another noted that “a full-sized 8 ft. bed would go over better for those employees who really need a truck”. Some of the drivers also noted that an easier-to-maneuver vehicle would be more desirable for city driving.

While not all fleet vehicles need a lot of cargo or towing capacity, data on 2011 vehicle registrations indicates that SUVs, vans and pickup trucks account for approximately 70% of government and commercial (excluding law enforcement)
fleet vehicle purchases (2). Most of the PEVs available today are much smaller light-duty cars. Therefore, the near-term PEV fleet market may be limited by existing vehicle styles. However, careful planning could go a long way towards matching available PEV models with a fleet’s operating profile.

Vehicle-application compatibility issues can be mitigated through careful vehicle placement and driver selection. One solution is to assign the smaller PEVs to supervisors or other staff who don’t require the same cargo capacity or have access to other substitute vehicles. However, since supervisors and office staff typically drive less than most professional work crews, the financial incentives to switch from gasoline to an alternative low-cost fuel decreases proportionally.

It was also suggested that the PHEV battery size be a customizable option. Although an intriguing proposition, it’s not clear that most fleet managers have the analytical resources to account for factors like vehicle load, driving behavior, charging frequency, and climate control when considering optimal vehicle range.

Installing and Using a Charging Network

Most of the fleet managers tasked with incorporating the RAM 1500 PHEV into their fleet did not have prior experience with citing, installing, or managing charging infrastructure. Proper placement, design, and use of the charging infrastructure is critical to maximizing electric driving and the benefits of PEVs. Easy and convenient charging for all users increases the proportion of CD driving which reduces fuel costs and petroleum consumption while maximizing environmental benefits.

Problems with charging infrastructure placement were observed for some of the organizations who participated in the demonstration. Some charging stations were located behind locked gates, far away from where drivers normally parked their vehicle, or in tight spaces that made parking and charging difficult. Overall, 27% of RAM PHEV survey respondents, if given the opportunity, would have moved their charging station to different location.

As highlighted by those who drove the RAM PHEV home, appropriate charging infrastructure may extend beyond the corporate yard or office, depending on how vehicles are used. Providing employees who commute home with a PHEV the option to receive compensation for using their home electricity to charge a work PEV, might help align their actions with the goals of the organization. Providing guidelines, public charger location information, and membership cards for away from home charging networks, while communicating the benefits of routine charging, may also help establish good charging practices beyond the workplace.

Most of the fleets had in-house capability to wire and install the single Level 2, J1772 charging station which came with the vehicle. Charging station installation was timely for most of the participants but a few reported it took longer, up to two months in some cases. Participants with the longest installation times had difficulty finding a secure location to install the charger, had permit delays, or tried to procure additional funding for installation. These challenges usually required cooperation or authorization from others from within and outside.
the organization. Charger installation complications tend to escalate with the installation of multiple charging stations.

A potential problem revealed during the demonstration was the propensity for organizations to assign charger equipment and installation costs to the vehicles using them at the time of installation. This often resulted in all the costs being inaccuracy apportioned to one vehicle which inflates the perceived PEV cost. A more accurate accounting practice would be to amortize charger-related costs over all the vehicles that use it during its functional life.

Finally, the fleets taking part in this demonstration project had almost no sense of the cost associated with charging the PHEV or how to separate electric vehicle charging from their total electricity bill. Billing users directly for electricity use, or budgeting PEV vehicle “fuel” costs may prove challenging for some who have no experience translating vehicle travel into electricity costs.

Restructuring Fleet Vehicle Purchase Criteria

A fleet manager’s job performance criteria often dictate that he/she select vehicles with the lowest purchase prices. This emphasis on upfront cost creates problems for fleet managers who want to purchase PEVs. One fleet manager describing how his decisions must make economic sense said:

“I’m trying to migrate people to more fuel efficient vehicles but it’s always a challenge because a lot of them aren’t running a lot of miles. So, we look at the payback and it’s like 15 years sometimes... there is always an economic analysis [associated with] what we’re doing.”

Some participants noted that they would be more inclined to lease a PEV but are unable to enter into any lease due to constraints placed on them by their employer. PEVs are particularly attractive to lease since the Federal incentives (varying from $2500 to $7500 per vehicle) can be immediately deducted by the dealer. At the same time, a lease frees the lessee of maintenance and resale cost concerns.

Since PEVs have been in the market for such a short time, the components which make up the total cost of ownership (TCO) for PEVs may not be fully understood by every fleet operator. For instance, there is little information about the residual value or resale value of PEVs. Fleets that are unable to lease and those with mileage-based or time-based vehicle retirement policies face an additional TCO calculation obstacle. As explained by one fleet manager, “the Chevy Volt could be the best fleet car ever because the return on investment is so high, but we just don’t know that yet [because the end-of-life value is unknown].”

DISCUSSION

We identified four value propositions for plug-in electric vehicles deemed important by organizational representatives who had the opportunity to use a RAM 1500 PHEV for more than a year. These values vary in importance
depending not only on the organization but, more importantly, on the responsibilities and job position of the evaluator. What is important for one employee may not even be a consideration for the individual tasked with purchasing fleet vehicles. We propose that effective PEV fleet marketing campaigns target strategic coalitions within organizations, so that all the PEV benefits are considered in the vehicle selection process.

The multitude of organizational complexities that affect PEV purchase decisions calls for a broader, more robust, PEV marketing strategy. Whereas vehicle purchase decisions are routine, PEV purchases will likely require a more strategic approach involving several individuals. It should not be pursued through normal channels. Tax breaks and subsidies, infrastructure installation, a fleet’s ability to accommodate PEVs, sustainability goals, corporate culture and image, and feedback from fleet networks are a few considerations that can complicate the purchase decision. Typically, no single person in the organization has full knowledge of all these factors.

The decision itself can take many paths. It may be a team collaboration that requires bargaining or compromise, a linear process that relies on an “idea champion” to move it up the chain of command, or a decision sent down from the top of the organization. Decision interrupts and vetoes anywhere in the decision process can undermine a chain of “yes” votes. Even top-down PHEV purchase directives can fail if the decision is not properly implemented. In some cases, the fleet manager may simply need a nod from upper management to feel comfortable enough to break with the convention of purchasing the least expensive option.

Our results also highlight a number of issues that must be addressed to ensure successful adoption of PEVs into fleets. Again, some of these - like charger installation - require input and action from employees who are not normally involved in the vehicle purchase process. Engaging these employees is imperative and requires planning before the purchase. The rate at which PEVs enter the fleet market depends on getting the right message to the right people within each organization and correctly matching products with customer needs.

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