Plug-in Electric Vehicle (PEV) Stakeholders Readiness Findings Report

An Evaluation of Vermont Automotive Dealerships, Current PEV Owners, and Fleets

Vermont Clean Cities Coalition

August 2012

Prepared by:
Michelle McCutcheon-Schour
With Glenn McRae and Tom McGrath

Transportation Research Center
Farrell Hall
210 Colchester Avenue
Burlington, VT 05401

Phone: (802) 656-1312
Website: www.uvm.edu/transportationcenter

Acknowledgements

Funding for this report was provided by the Vermont Public Service Department through the U.S. Department of Energy's Energy Efficiency and Conservation Block Grant program. We extend grateful acknowledgment to Karin McNeil and staff from the Vermont Public Service Department, staff from the Vermont Department of Motor Vehicles, the Vermont Vehicle and Automotive Distributor's Association (VADA) and their members, fleet managers at Vermont businesses and institutions, and the "early adopters" of PEV technology in Vermont. Special thanks to Alexandra Evarts of the Vermont Clean Cities Coalition for her contributions to this report.

Disclaimer

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the UVM Transportation Research Center. This report does not constitute a standard, specification, or regulation.

Table of Contents

Key Acronyms and Definitions[1]

Acronym	Full Name	Definition
ICE	**Internal Combustion Engines**	Engines that generate mechanical power by burning liquid or gaseous fuel. Currently, they are the dominant power source used in vehicles.
EV	**All-Electric Vehicles**	Vehicles powered only by electric motors. These vehicles obtain all of their energy through a plug that extracts energy from an electric grid and store that electricity in batteries. They use no petroleum-based fuel while driving and produce no tailpipe emissions.
HEV	**Hybrid Electric Vehicles**	A vehicle that is powered by a combined power source that includes an ICE and an electric motor, battery, and regenerative braking. These vehicles use a petroleum-based or alternative fuel to power an ICE or other propulsion source.
EVSE	**Electric Vehicle Supply Equipment**	Equipment that delivers electrical energy from the electric grid to charge electric-powered vehicles. Also known as "charging stations."
PHEV	**Plug-In Hybrid Electric Vehicles**	Similar to a HEV, these are vehicles that are powered by a combined power source that includes an ICE as well as an electric motor, battery, and regenerative braking. Unlike HEV, they also use a plug to pull energy from the electric grid. These vehicles use a petroleum-based or alternative fuel source to power an ICE or another propulsion source.
PEV	**Plug-in Electric Vehicle**	Vehicles that derive all or some of their power from the electric grid. These include EVs and PHEVs.
OEM	**Original Equipment Manufacturers**	Manufacturers that originally produce a product.

[1] List adapted from http://www.afdc.energy.gov/pdfs/51226.pdf on August 2, 2012

1. Introduction

1.1 Project Summary

This report is the result of a three-month outreach project funded by the Vermont Public Service Department (PSD) through a grant from the Energy Efficiency and Conservation Block Grant Program (EECBG) of the U.S Department of Energy (DOE). This project was carried out by the Vermont Clean Cities Coalition (VTCCC) as part of the University of Vermont's Transportation Research Center's (TRC) outreach efforts.

The overall purpose and goals of this project were to disseminate information, create dialogue, and build capacity among targeted groups of stakeholders who are vital for the mass deployment of plug-in electric vehicles (PEVs) in Vermont. These efforts sought to:

- Raise excitement about EV technology.
- Give participants the ability to accurately inform customers and peers of what to expect in the future.
- Explain why EV technology is important.
- Build capacity for this group of stakeholders and VTCCC to be engaged in Drive Electric Vermont planning and activities.

This statewide project sought to expand, bring together, and inform a wide range of individuals and organizations on how they can best prepare for PEV deployment throughout Vermont.

1.2 Key Stakeholder Groups

The stakeholders identified and targeted for this project included automotive dealerships in the state of Vermont, their manufacturing affiliates, current PHEV and EV owners who reside in Vermont, and fleet managers. These stakeholder groups were each chosen for their unique perspectives, opinions, and knowledge of electric vehicles, as well as their roles in the introduction, marketing, and promotion of PEVs. Due to various limitations, this project focused only on stakeholders who were either located in or highly involved with Vermont.

In order to gather information for this project, dealerships were visited in order to understand their experiences selling PEVs. They also responded to questions online through a query in support of the project by their trade association, the Vermont Vehicle and Automotive Distributors Association (VADA). Discussions were held with representatives from major PEV manufacturers to gather their perspective on continued technological innovation in the field, and the marketing and promotion of the technology. EV and PHEV owners were invited to an open networking forum where they shared their opinions and ideas on electric-powered transportation in Vermont.

2. The Auto Industry: Background

2.1 The Dealership and Manufacturer Relationship

In the United States, the majority of new vehicles are purchased through independently owned motor vehicle dealerships. In order to sell factory-authorized vehicles, a motor vehicle dealership must enter into a legally binding franchise agreement with a motor vehicle manufacturer. Franchise agreements outline the duties and obligations of the manufacturer and the dealership in the selling, delivering, and warranty services of a new vehicle.

Franchise agreements are regulated mostly at the state level by automotive franchise laws. In Vermont, the Vermont Dealership Franchise Law serves two main purposes. First, it regulates the relationships between the franchisee and the franchisor to ensure fair bargaining power to independent dealerships in their dealings with large-scale corporate manufacturing entities. Second, it aims to ensure that all vehicle manufacturers, dealerships, and anyone else doing business in the state treat consumers fairly.[2]

In order to have new vehicles on their lots, dealerships must purchase motor vehicles from the manufacturers or a distributor working for the manufacturer. This purchasing process varies widely among dealerships, manufacturers, and distributors. Generally speaking, dealerships request vehicles for purchase from the manufacturer or distributor a few months ahead of time. Dealerships are allowed to request a certain amount of cars based on their previous selling records.

After this initial request, the purchaser and the seller enter into a negotiation process. According to the Vermont Dealer Franchise Law, a manufacturer cannot force a dealership to purchase certain cars. The only requirement of the dealership is to represent the "line of those motor vehicles which the manufacturer or distributor is publicly advertising".[3] Legally, this gives the dealership a great deal of liberty when it comes to ordering vehicles. However, manufacturers and distributors have an arsenal of negotiation tactics that they can use to push the dealership into ordering specific vehicles.

It benefits independent dealerships to maintain a strong and healthy relationship with their manufacturers and vehicle distributors because of the power they hold. These vehicle suppliers can make it easy or difficult for a dealership to obtain the vehicles they want most. For example, in order to get a dealership to purchase vehicles they do not particularly want, the manufacturer or distributer may offer them first pick of a very popular model that the dealership may not have ready access to.

[2] Paraphrased from the "Vermont Dealer Franchise Law, Title 9: Commerce and Trade, Chapter 108", as published in the 2012 Vermont Vehicle & Automotive Distributors Association (VADA) Membership Directory.
[3] Quoted from "Title 9 Commerce and Trade Part IV Regulation of Trade, Chapter 108. Motor Vehicle Manufacturers, distributors and dealers franchising Section 4096. Unlawful acts by manufactures or distributors".

2.2 PEV Manufacturing

Original equipment manufacturers (OEMs) of automobiles have been required to invest heavily in new technologies, due to increasing consumer preference towards vehicles with lower carbon footprints and new regulations from governments such as the new Corporate Average Fuel Economy (CAFÉ) standards.[4] These new technologies must not only reduce the environmental impact of their products, but to succeed for the OEM they must also keep manufacturing costs low.

OEMs are researching a variety of new fuel technologies to meet these new requirements, including natural gas, biodiesel, hydrogen/fuel cells, propane, ethanol, and electricity. Currently, electric-powered vehicles are emerging as one of the most viable and popular options for new vehicle technology, especially for passenger vehicles. In the last few years, multiple manufacturers have rolled out multiple PHEV and EV models. These models include the Toyota Prius Plug-in, the Nissan Leaf, the Chevy Volt, the Mitsubishi MiEV, and the Tesla Roadster. Each of these models is unique and each represents a different electric vehicle ownership experience for consumers. The Toyota Prius Plug-in and the Chevy Volt are PHEVs, and provide an individual the opportunity to own an electric-powered vehicle with a back-up gas powered source. The Nissan Leaf and the Mitsubishi MiEV are EVs, meaning they have no back-up petroleum power source.

For the most part, when OEMs begin to sell a new EV or PHEV in the United States, they only distribute them to a few areas of the country where they believe the models will sell best. There are two primary characteristics that OEMs evaluate when deciding which markets will receive new electric-powered models:

1. Adoption of the California Zero Emission Vehicle (ZEV) Program which requires OEMs to produce a number of ZEV and ZEV-enabling technologies each year.[5]
2. Recorded sales of hybrid vehicles.

Areas that have sold a high number of hybrids in the past and have ZEV requirements are where OEMs usually test market their EV and PHEV models first.

[4] For more information, see http://www.nhtsa.gov/About+NHTSA/Press+Releases/2012/Obama+Administration+Finalizes+Historic+54.5+mpg+Fuel+Efficiency+Standards

[5] For more information, see http://www.arb.ca.gov/msprog/zevprog/factsheets/zev_fs.pdf

3. The Auto Industry in Vermont: Background

3.1 General Overview

According to the 2012 National Automotive Dealers Association's (NADA) yearly report, in 2010, there were 86 new-car dealerships in Vermont. These dealerships employed 2,621 employees, including salespeople, technicians, service and parts workers, supervisors, and general office workers. In 2011, dealerships in Vermont sold $1.56 billion in new and used vehicles, representing 14.0% of Vermont's total retail sales. That same year, 30,085 new vehicles were registered with the Department of Motor Vehicles (DMV).[6]

3.2 The Vermont Vehicle and Automotive Distributors Association (VADA)

The Vermont Vehicle and Automotive Distributors Association (VADA) is widely subscribed to by the automotive dealership industry in Vermont. VADA is a non-profit made up of franchised vehicle and parts dealers and distributors throughout Vermont.[7] VADA was established in 1945 and since then has worked to grow its membership and influence. VADA offers many services to its members, including insurance, workers' compensation, education programs, publications, a consumer action panel (AUTOCAP), and lobbying efforts on behalf of its members. VADA's Executive Director, Marilyn Miller, has held her position for 27 years and is extremely well-known among automotive dealership salesmen, managers, and owners. The VADA network can be an extremely effective outlet for communicating and networking with automotive dealerships throughout Vermont.

[6] For more information, see the 2012 NADA Data State of the Industry Report at http://www.nada.org/NR/rdonlyres/0798BE2A-9291-44BF-A126-0D372FC89B8A/0/NADA_DATA_08222011.pdf.

[7] Information adapted from VADA's website at http://www.vermontada.org/

4. Dealerships in Vermont: Stakeholder Evaluation

4.1 Introduction

Outreach was conducted with 14 dealerships involving conversations with salespeople, dealership owners, and maintenance personnel. Most efforts were conducted in person, but some were completed by phone interviews or follow-up calls. In addition, VADA fielded a survey to all of its members in order to gather additional data.

Dealerships are the primary gatekeeper to electric vehicle ownership. A salesperson has the ability to sway people either towards or away from electric-powered vehicles. Dealership owners and managers can choose to ignore or highlight electric vehicles in their showrooms.

In Vermont, four major PHEV and EV models are available at dealerships. These models include the Toyota Prius Plug-in, the Nissan Leaf, the Chevy Volt, and the Mitsubishi MiEV. The number of PEV vehicles available at dealerships in Vermont was evaluated at the beginning and the end of this project; Table 4-1 demonstrates these findings:

Table 4-1. Number of PEV Available at Vermont Dealerships by Model - Summer 2012[8]

Date	21-Jun-12	29-Aug-12
Volts	15	9
i-MiEV	5	4
Leaf	5	5
Plug-in Prius	39	46
Total	64	64

As see in Table 1, at the beginning of this project and at the end, there were 64 PEV vehicles available at Vermont dealerships. Despite this number staying the same, there appears to be some movement of vehicles.

4.2 Opportunities for PEV Deployment

Dealerships with PEVs on their lots have the ability to give these vehicles new exposure by placing them in the front of their lots. They also have the opportunity to introduce individuals to this new technology.

Dealerships also have access to a vast amount of information and promotional materials for PEVs given their direct relationship with manufacturers. Manufacturers spend an enormous

[8]The number of Volts decreased by six and the number of i-MiEV's decreased by one, while the number of Plug-in Prius increased by seven. Dealerships regularly swap vehicles in order to meet their customers' requests. Department of Motor Vehicle (DMV) data was reviewed to determine if tracking registration of PEV models could help determine if those units that left dealerships between June 2012 and August 2012 were as a result of sales. The DMV data was deemed to be inaccurate because PEVs are categorized under various fuel types. Therefore, no conclusions could be made. The DMV is currently working with stakeholders to improve their methods of recording alternate fuel vehicles and to establish better access to quality data.

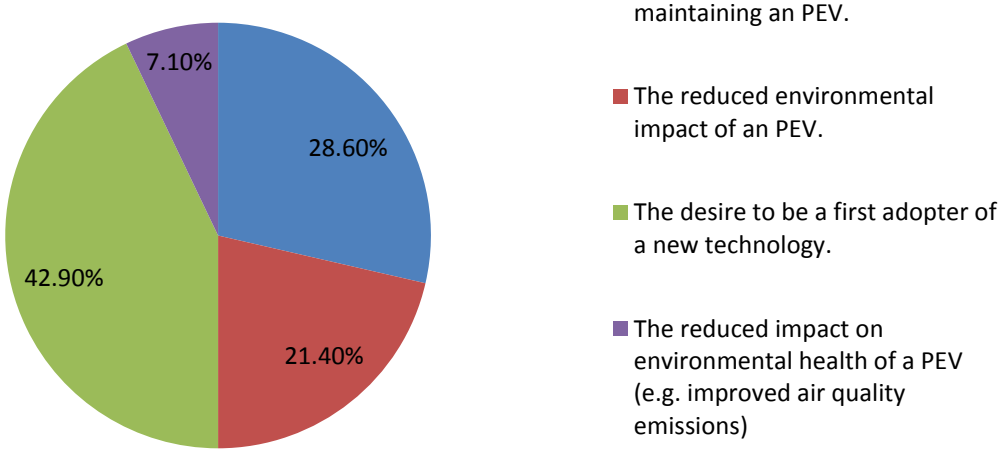
amount of time and money on market research and thus create some of the most powerful and polished marketing materials available.

There are many benefits of PEV ownership that dealerships can explain in their sales pitch. Dealers surveyed pointed to the benefits below as the most effective selling points of PEVs:

1. The desire of the purchaser to be a first adopter of a new technology.
2. The reduced cost of fueling and maintaining an electric-powered vehicle.
3. The reduced environmental impact of an electric-powered vehicle.
4. The reduced environmental health impact of an electric-powered vehicle (e.g., improved emissions).

Using a survey distributed by VADA, dealerships were asked which of these selling points is the most effective. Figure 4-1 shows that a majority of dealerships in Vermont who currently sell, or whose franchise can sell EV's or PHEVs (total of 15 of the survey respondents), believe that the desire to be a first adopter of a new technology is the main selling point of these models.

Figure 4-1. The Main Selling Points of Electric Vehicles



4.3 Barriers to PEV Deployment

Dealerships face many barriers to selling and carrying PEVs including:

1. **The cost of certification to sell PEVs from the manufacturer.** When an OEM designs a new vehicle, it is customary that dealerships prepare their staff and facilities to carry these vehicles. These requirements (time, money, infrastructure, and training) can vary greatly between models. Because electric vehicles are so new, dealerships must make significant investment. These investments tend to be greater than those needed to sell traditional vehicles and can include new service equipment, charging stations, and extensive training of sales associates and service mechanics. Some dealerships might need to hire new specially trained technicians to service PEVs.
2. **An uninformed customer base.** Even well-educated consumers take extra time at dealerships to test out vehicles and experience new technologies. According to dealerships, their general customer base is uneducated about or at least unfamiliar with PEVs. As a result, salespeople need extra time with potential customers to explain PEVs. According to one manufacturer representative, it can take up to three times longer for a salesperson to sell a PHEV or EV compared to selling a traditional ICE vehicle.
3. **The resale value of a PEV.** Dealerships also noted that some customers express concern about being early adopters, especially related to concern with the future resale value, a factor that many new car buyers calculate into their decision. If the vehicle and battery technology continues to improve, will their cars hold their value in a few years? Who will want to buy a used 2012 PEV?
4. **Keeping their entire sales staff up-to-date regarding PEV technology and information.** In an effort to understand the consumer's experience of buying a PEV, outreach personnel were taken through the sales staff's pitch for selling a PEV at seven of these dealerships. At five of these dealerships, the sales staff appeared to be ill-informed on PEVs and some even presented incorrect or misleading knowledge such as:
    a. Misrepresenting the PEV's electrical driving range.
    b. Underestimating or overestimating the cost of charging a PEV's battery.
    c. Having little to zero knowledge on home charging stations.
    d. Not knowing what would happen to the battery if an accident were to occur.

    At two of these dealerships, salespeople appeared to have no knowledge of the PEVs they were selling and simply read out of the manufacturer's brochure. Potential customers receiving such a sales pitch will likely be discouraged from purchasing electric-powered vehicles.
5. **Lack of interest from their general customer base.** Vermont dealerships, both those visited and surveyed, uniformly indicated that they were finding relatively little interest in electric vehicles. When surveyed, 86% of the dealerships whose franchisors carried PEVs for sale said that 0-10% of their customers inquire about EVs or PHEVs. As a result, it can sometimes be months between a salesperson's training and the actual sale or inquiry of a PEV. This additional lag time can impact the knowledge base and readiness

of a sales person to respond effectively to an inquiry and be up-to-date on the vehicle qualities.

6. **Possible loss of revenues from PEVs.** For many dealerships, PEVs do not fit into their current business model. Dealerships interviewed for this project mentioned that the majority of their revenues are generated from their service department. On a national level, from 2006-2010, dealerships experienced negative net profits from their new-vehicle departments while their service and parts department had increasing positive net profits.[9] This business model presents a unique issue with electric vehicles. One of the main selling points of PEVs is that they require less maintenance compared to ICEs. While this creates savings for the consumer, dealers expressed concern that more PEV sales will result in a significant loss of revenue for dealerships. As dealerships need to invest significant time and money just to carry the vehicles, such a concern creates additional financial disincentives for dealerships.
7. **Average sales time of a PEV.** According to the three sales managers and the two manufacturer representatives spoken to for this project, one of the largest barriers to increasing PEV sales is the time it takes to sell them compared to ICE vehicles. One manufacturer representative stated that it can sometimes take a salesperson three times longer to sell a PEV compared to an ICE. Steps that a PEV buyer usually takes to increase the vehicle's sales time include:
    a. Looking through the motors and the electric parts.
    b. Multiple test drives in different weather conditions and on different terrains.
    c. Discussions on charging stations and charging options.
    d. Visits to the dealerships before and after having their home evaluated for charging station installation.

4.4 Sales Staff Training

As noted above, this project found that many salespeople were underprepared to sell PEVs. Training for sales associates is, on the whole, either prepared or sponsored by manufacturers. Sales staff can be trained through two different methods; in-person-training sessions or online webinars. In-person-training can happen either at regional training facilities owned by manufacturers or in dealerships with manufacturer trainers. In addition, manufacturers provide sales staff with a variety of technical and informational reference materials.

The informational and training materials reviewed for this project were more than sufficient to provide accurate and compelling information to customers. The materials were usually fairly long in length and contained thorough explanations of the new technology. These materials also educated the salespeople on other PEV models on the market in order to demonstrate how their PEV was different.

[9] For more information, see the NADA DATA 2011 State of the Industry Report at http://www.nada.org/NR/rdonlyres/0798BE2A-9291-44BF-A126-0D372FC89B8A/0/NADA_DATA_08222011.pdf.

In discussions with many of the sales staff who had attended trainings and received materials, we found that they were not able to recall much of the information. This information gap may be the result of how and when sales associates are trained. Sales associates are regularly trained months in advance of new models being delivered to their dealerships. Their lack of knowledge could be a result of this lag time, especially with new technologies with which they are unfamiliar.

Another factor in this equation is the high turnover rate of sales staff at dealerships. Sales associates regularly switch dealership and manufacturers, requiring them to learn about a whole new line of vehicles. If a sales associate switches manufacturers, it could be a while before they are trained in the PEVs at their new dealership.

In order to address the issue of ill-informed salespersons, some manufacturers require dealerships to send one or two people to special in-person trainings. Despite this requirement, according to manufacturer representatives interviewed for this report, any sales associate can sell an electric vehicle. At only one of the 14 dealerships visited for this project was outreach personnel given a PEV specialist to speak to. Through these visits, the best trained electric vehicle sales staff were those who had spent time selling the vehicles. The three most educated salespeople found at these dealerships were ones who had sold two or three PEVs in the last few months. Only one of these three people was a certified specialist by their manufacturer. These individuals had the quickest answers to the outreach personnel's questions and had the most accurate information on the vehicles. One sales associate informed the project staff that he had remembered little from his manufacturer-sponsored training taken months ago. Rather, he had gathered information by spending time with a particular customer who spent many hours with him investigating the vehicle.

4.5 Action Steps to Further Engage Dealerships

Local Vermont dealerships are key stakeholders in any effort to increase PHEV and EV ownership. As noted above, dealerships have many reservations regarding electric-powered vehicles. PEV sales can create a lot of issues for dealerships and some of the attributes of PEVs are problematic. Given the business model most dealerships run on, there is concern that increased PEV sales can actually result in lost revenues.

Despite their hesitations, most dealerships did express willingness to engage in new activities that will assist them in selling these vehicles. They are willing to partner with outside groups to increase exposure and expand consumer interest in PEVs. This was demonstrated by the wide participation at the Drive Electric Vermont Demo Day on August 8th [10], where potential customers could test-drive PEV models, and where media coverage focused on prominent officials participating. Based on the number of dealerships that participated, it appears that there is broad interest among what are usually competing franchises to advance customer acceptance of the technology at this stage, rather than to just sell one individual model.

[10] For more information and pictures from Drive Electric Vermont Demo Day 2012, see https://www.facebook.com/media/set/?set=a.506417859372217.127448.502119523135384&type=1.

Examples of events that could engage dealerships while exposing consumers to PEV technology include:

- **Public educational events such as the 2012 Odyssey National Alternative Fuel Vehicle Day.**
- **Ride-and-drive events at businesses that allow employees and managers to experience PEVs.**
- **Events that bring together service managers from dealerships with potential commercial purchasers to discuss the maintenance needs of PEVs.**

Dealership representatives also suggested that it would be valuable if other stakeholder groups begin to direct individuals or groups with questions regarding electric vehicles to dealerships. According to dealerships, they are not regularly asked questions regarding PHEVs and EVs by consumers. Salespeople are not retaining knowledge learned about PEVs because opportunities to discuss electric vehicles are infrequent. The more individuals inquire about EV and PHEVs, the more salespeople will be incentivized to learn about them.

4.6 Dealership Suggestions for Policy Actions

For this project, 14 dealerships were visited; at these dealerships 19 individuals were asked what policies and actions they would like to see in order to further the sales of PEVs. Out of these discussions, three suggestions kept resurfacing;

1. **Provide purchasing incentives for consumers such as tax incentives or cash incentives at time of purchase.**
2. **State procurement can lead the way; state purchasing of PEVs would increase the vehicle's visibility and expose new consumers (e.g., state employees) to the technology.**
3. **Develop and launch educational campaigns for the public that focus on the capabilities of PEVs in the Vermont climate and terrain.**

Currently, there are federal tax credits available for PEVs. According to Nissan's research in states with one incentive on top of the federal tax credits, people were 216% more likely to order a PEV. In states with two or more incentives on top of the federal tax credits, people were 300% more likely to order. Many participants in the project pointed out that tax credits were not a great incentive as they impact the consumer long after the purchase. Incentives at time of purchase are most effective (e.g., reduced sales tax or registration fees).[11]

As in other areas (purchase of recycled paper and products, local food, and so on) the state has enormous purchasing power and can help move a market. In addition, the state purchase of PEVs

[11] See Gallagher & Muehlegger (July 2011), "Giving Green to Get Green? Incentives and Consumer Adoption of Hybrid Vehicle Technology" from the Journal of Environmental Economics and Management. Also see Diamond (March 2009), "The Impact of Government Incentives for Hybrid-Electric Vehicles: Evidence from US States" from the Energy Policy Journal.

would highly increase their visibility around the state and provide a vote of confidence for future consumers. State vehicles that are PEVs should be clearly advertised as such.

Highly visible state vehicles could be one part of a state educational campaign to raise awareness and interest. In particular, promoting the stories of current owners of PEVs in Vermont and how they have found them to be reliable and advantageous will be most effective – Vermonters telling their stories to Vermonters.

4.7 Incentives for Dealerships

Through interviews with dealerships, manufacturer representatives, and industry experts such as Dealer.com, it became evident that dealerships are not incentivized to sell PEVs. Between the costs of becoming a certified PEV dealership and the extra time it takes to sell PEVs, dealerships have very little reason to push PEVs over ICE models.

A non-dealership stakeholder suggested that an effective step might be for the state to focus attention on designing incentives for dealerships rather than consumers. **Financial incentives for dealerships from the state such as tax credits could help subsidize some of the initial costs to the dealership as well as the possible revenue loss from selling PEVs.** Such a program would be easier to manage and the long-term benefit would be growing the business capacity to sell more PEVs rather than providing incentives to a relatively few individuals.

5. Fleets in Vermont: Stakeholder Evaluation

5.1 Introduction

In Vermont, there are a variety of different organizations, such as shipping companies, utility providers, cities, and hospitals that have fleets of vehicles. Each one of these fleets is unique and has a very different budget and needs. For some fleets, PEVs would be appropriate, while for others no PEV currently on the market would fit their business needs.

5.2 Opportunities for PEV Deployment

Private and commercial entities have characteristics that would make PEV adoption easier for them compared to non-commercial buyers. These characteristics include:

1. Fleet operators understand the needs that their vehicles and performance standards must meet. PEVs purchased for fleet use would most likely be put to appropriate use and would likely succeed in those uses.
2. Fleet operators are well versed in the purchase and leasing of vehicles and have access to capital or financing, as well as the ability to depreciate an asset, which is not necessarily available to individual consumers.
3. Companies and/or private entities that have larger fleets usually own parking facilities where they could easily install charging stations.
4. Many organizations have set hours in which they do not operate when vehicles could be charged. There are also businesses and organizations that have very defined routes for the fleets and could plan ahead to ensure that vehicles do not lose charge.

Private and public fleets have the potential to advance early adoption of PEVs.[12] **When a commercial or institutional fleet adopts a PEV, it provides a "vote of confidence" to non-commercial buyers considering such a purchase.** Fleet adoption of PEVs offers unique opportunities to directly expose potential consumers to electric vehicles by providing their employees with the opportunity to experience electric vehicles.

Most consumers have little to no experience owning, operating or maintaining electric vehicles, or they have misinformation regarding the safety, practicality, and functionality of electric vehicles. When a fleet purchases an electric vehicle, they increase the exposure of the technology and provide their employees an opportunity to experience the vehicles with no personal financial risk. These employees can become effective ambassadors to their social networks if they have a positive experience with PEVs through their employment.

[12] See Strategy #13 of the Vermont Comprehensive Energy Plan 2011 at http://publicservice.vermont.gov/2011%20CEP_Volume%202.pdf

5.3 Barriers to PEV Deployment

During this project, five fleet managers were interviewed to understand the opportunities for adoption of PEVs. These discussions revealed that fleet managers and owners have numerous concerns regarding PEVs. These concerns included:

1. **The purchasing cost of a PEV compared to an ICE vehicle.** Fleets tend to purchase the cheapest vehicle that fits their need. Many EVs and PHEVs have baseline prices that are much higher than what fleet managers are used to spending. For example, multiple fleet owners mentioned that they do not like to spend more than $20,000 on their light duty vehicles. There is currently no EV or PHEV on the market that starts below $20,000, even after the $7,500 federal tax credits available for some EVs or PHEVs. While fleet managers understand the business case for evaluating operations and maintenance costs along with purchase cost in the assessment of possible vehicles to purchase, time frames for vehicle turnover in fleets often do not allow for lower operations and maintenance costs to compensate for higher initial purchase prices.
2. **Minimum need for small or light duty vehicles.** Some fleets have limited use for small or light duty vehicles, which represents the majority of PEVs available on the market. The majority of public and private fleets have at least a few light duty vehicles for administrative or sales staff. These vehicles, however, can represent a very small percentage of the fleet's overall cost. Fleets such as utility companies, shipping companies, or municipalities have many vehicles, but the majority of their vehicles are medium or heavy duty. Currently, there are very few electric-powered options for medium or heavy-duty vehicles.
3. **Concern that PEVs would be unpopular with their employees and will be left unused.** Many fleets have multiple cars from which employees can choose. Fleet managers are concerned that employees will be uncomfortable checking out a PEV and as a result, the vehicles would be left unused.
4. **PEVs do not fit into their current vehicle cost calculations.** When purchasing new vehicles, fleets normally apply a cost calculation that estimates the full cost of a vehicle over its lifetime. This cost analysis takes into account the vehicle's purchase or lease cost, fuel costs, maintenance costs, and resale value. Calculating lifetime costs of an EV or PHEV may require fleets to alter their cost calculations, especially the timeframe they consider. For example, multiple fleet managers mentioned that they calculate the cost of their vehicles over five years because this is the best age to sell back a vehicle. Due to the initial purchase price of an electric vehicle, owners do not experience financial savings until they have owned the vehicle for at least eight or ten years.
5. **Past negative experiences.** Three of the fleet managers interviewed for this project had purchased EVs in the 1990s when the technology was extremely new. All three had extremely bad experiences with this first generation of EVs. Many reported that the vehicles failed to operate normally, such as failing to drive up hills or often not starting

properly. As a result, these fleet managers are extremely hesitant to experiment again with EVs.

Another barrier to fleet adoption of PEVs is that, similar to many individual consumers, fleet managers were misinformed about PEVs. Some misconceptions of PEVs that fleet managers mentioned during project outreach discussions included:

1. PEVs will not make it up steep hills, especially with a lot of weight in them.
2. Charging PEVs will greatly increase their business' utility costs.
3. All PEVs are all electric and could never be used for long trips. Many fleet managers did not know that plug-in hybrids are available.
4. If you leave a PEV unused for too long, their batteries will die and will need to be replaced.

5.4 Action Steps to Further Engage Fleets

In order to increase the use of PEVs by both public and private fleets, steps can be taken to expose purchase decision-makers to the positive attributes of PEVs. Generating more positive attitudes towards electric-powered vehicles among fleet owners can result from effective outreach and direct experience with the new technologies. **Effective outreach to accomplish this can consist of:**

- **Directed events that expose purchase decision-makers to PEVs—allowing them to experience the new technologies first-hand and ask questions regarding the vehicle capabilities—appears to be an essential first task.**
- **Identifying events that fleet managers already attend that could expose them to PEV technology.**
- **Creating materials that make the business case for adopting PEVs. These materials should include new lifetime vehicle cost calculations that address the attributes of PEVs.**
- **Promotional materials that highlight the variety of PEVs available for fleets.**
- **Educational materials on EVSEs. Some questions fleet managers had regarding charging stations included:**
    1. **How much does it cost to install a charging station and use it for fueling vehicles compared to traditional fuel costs?**
    2. **What type of liability exists with having a charging station at a business? Is there any harm that could be brought to an employee or customer?**
    3. **What is the lifespan of a charging station and what are the maintenance costs?**

The project actively sought to engage fleet managers as a group and made a series of efforts to host an event for fleet managers. This proved unsuccessful after attempting to contact over 200 fleet managers with only one response. It is suggested that events to expose fleet managers to

electric vehicles be combined with others in which fleet managers are more likely to already be attending. In the meantime, one-to-one outreach will continue to be the most effective mode of engagement.

6. PEV Owners in Vermont: Stakeholder Evaluation

6.1 Introduction

PEVs produced by major manufacturers are relatively new to the automotive industry in Vermont. Despite this, there are already a number of individuals who own PEVs in the state. According to data from the Vermont Department of Motor Vehicle (DMV) there are currently 115 electric vehicles registered in Vermont.[13]

While there are a variety of PEVs registered with the DVM, including the Chevy Volt, the Nissan Leaf, and the Tesla Roaster, the majority of these vehicles appear to be Global Electric Motorcars (GEMs). GEMs are small, low-speed, neighborhood vehicles, which have top speeds around 20 miles per hour (MPH), making them unsafe on highways. GEMs are great alternatives to traditional vehicles but they are not intended for highway travel and thus are not a replacement for a traditional ICE vehicle as other PEVs can be. While they currently figure in reporting numbers, their numbers are not seen as a valid indicator due to their limitations.

6.2 Opportunities for PEV Deployment

As part of this project, on August 13, 2012, eight electric-powered vehicle owners from Vermont came together at Healthy Living Market (site of an early EV Charging station) in South Burlington for a discussion held by the Vermont Clean Cities Coalition (VTCCC). On hand were the owners of four Chevy Volts, two Teslas, one converted motorcycle, and one converted sedan.[14] During the discussion, participants raised many insightful and important points regarding vehicle ownership, use and maintenance, as well as charging regulations and infrastructure including:

1. Ways of addressing range needs, such as renting ICEs when they take long road trips.
2. Ideas on how to charge their vehicles in non-traditional places such as hotel rooms. Many mentioned renting hotel rooms on the bottom floor of hotels so that they could back their vehicles up to the windows and charge overnight.
3. Benefits for charging at night to encourage individuals to charge at off-peak times.
4. The need to support businesses in setting up charging stations.
5. The best way to educate individuals on PEVs is to connect with current owners and allow them to experience the cars first hand. Many of the PEV owners at the event mentioned that they themselves were hesitant to purchase a vehicle until they were able to drive one.

[13] It must be noted that this data may not accurately represent how many electric vehicles are in Vermont. The DMV is still refining their methods in recording PEVs, especially for PHEVs. Currently PHEVs can be recorded as either hybrids or as electric vehicles.

[14] Also in attendance at the luncheon were Karin McNeil from the state's Public Service Department, Don Lorriane from Green Mountain Power, and three VTCCC staff members.

The group's passion for their plug-in vehicles was evident. This event demonstrated how such early adopters of PHEVs and EVs could be vital stakeholders as community educators, public boosters and promoters, and active demonstrators of the value of these vehicles for personal use in the state. Having experienced electric vehicle ownership first hand, they are extremely capable of dismantling any misinformation or perceptions of electric vehicles.

Increasingly, car purchase decisions are being researched through social media and evaluated based on user reviews and experiences related in forums separate from dealers and manufacturers. According to a recent report by Dealer.com, 38% of new vehicle buyers will use a social media outlet, such as Facebook, to research their next vehicle purchase.[15] **Creating an online forum by utilizing current social media tools would be a great way to connect current PEV with potential PEV customers.** Tools like these would also be a great way to expose individuals who have not previously considered PEVs. The survey by Dealer.com also found that 48% of new vehicle buyers using social media outlets to research new vehicles had seen a comment on a social media website that prompted them to consider a new brand or model.

6.3 Barriers to PEV Deployment

Current PEVs owners are generally well educated about their vehicles. The majority researched these vehicles for months prior to purchasing. According to both the vehicle owners and dealerships contacted for this project, the majority of individuals who purchase PHEV and PEV are extremely well informed before they go to a dealership. For the most part, these purchasers simply use the dealerships to test drive, purchase, and deliver the vehicle. As a result, salespeople do not find it necessary to be extremely educated on these vehicles in order to sell them at this stage of PEV market infiltration.

6.4 Action Steps to Further Engage PEV Owners

The majority of PEV and PHEV owners contacted for this project are willing and eager to assist anyone working to promote electric-powered vehicles. Having first-hand experiences with PEVs, these owners are a knowledgeable and accessible resource for other potential owners. While many PEV owners know one another, they currently are not organized in a way that would make them effective as a stakeholder group. In order to make best use of this potential resource, mechanisms should developed and set up to help organize this group and connect them with such efforts as Drive Electric Vermont. Such mechanisms may include:

- **An online forum for EV and PHEV owners to discuss issues and swap ideas related to electric-powered vehicle ownership.**
- **An online tool to easily connect potential EV and PHEV owners with current ones.**
- **Opportunities to participate in events and car "rallies" to show off their vehicles (similar to Classic or Antique Car events).**
- **Opportunities to participate in local events, such as local town energy fairs.**

[15] For more information, see "The Rise of Loyalty, Advocacy, & Influence" by Dealer.com at http://static.dealer.com/sites/d/ddcsite/pdf/LoyaltyAdvocacyInfluenceResearchReport.pdf

7. Project Highlights and Key Recommendations

The following are summaries of information gained and recommendations from the project stakeholders about how to increase the adoption of PEVs in Vermont. These recommendations do not necessarily represent the opinion or position of the University of Vermont Transportation Research Center, the Vermont Clean Cities Coalition or the Vermont Department of Public Service.

Stakeholders agree: PEV outreach efforts should be focused on getting people into the cars to experience the technology firsthand.

There are many misconceptions about PEVs among the general public. Dealerships, manufacturers, and PEV owners alike all agree that the best way to educate individuals and dismantle myths about PEVs is to get people into the cars at events such as Ride-and Drive Events. These types of events are also a great way to keep dealerships engaged in PEV outreach efforts. Throughout this project, dealerships have shown a great willingness to engage in these types of events. Increasing the visibility of the cars and people driving the cars is the most cost-effective approach to advancing the adoption of the technology.

Commercial or institutional fleet adoption is key to PEV deployment. Outreach efforts should be tailored to attract fleets to PEV use.

When a commercial or institutional fleet adopts a PEV, it provides a "vote of confidence" to non-commercial buyers considering such a purchase. Commercial and public fleets have characteristics that make PEV adoption easier compared to non-institutional purchasers.

- Fleet operators understand the needs for their vehicles and performance standards that they must meet. PEVs purchased for fleet use would most likely be put to appropriate use and would be likely to succeed in those uses.
- Fleet operators are well versed in the purchase and leasing of vehicles and have access to capital or financing, as well as the ability to depreciate an asset, not necessarily available to individual consumers.
- Companies and/or private entities that have larger fleets usually own parking facilities where they could easily install charging stations.

Many organizations have set hours in which they do not operate when vehicles could be charged. There are also businesses and organizations that have very defined routes for the fleets and could plan ahead to ensure that vehicles do not lose charge.

An essential first task will be directed outreach events that get decision makers for fleet vehicle purchasing into PEVs, allowing them to experience the new technologies first hand and ask questions regarding the vehicle capabilities. In addition, materials that make the business case for adopting PEVs should be created. These materials should include new lifetime vehicle cost calculations that address the attributes of PEVs in a format that fleet managers can use.

An online forum, utilizing current social media tools should be created to connect current PEV with potential PEV customers.

Currently, there is a small group of individuals who live in Vermont and own a variety of PEV models. The project found that these owners were highly educated on PEVs and extremely passionate about their use. PEV owners are a great resource for individuals interested in PEVs. According to a recent report by Dealer.com, 38% of new vehicle buyers will use a social media outlet, such as Facebook, to research their next vehicle purchase. These outlets should thus be utilized to connect current PEV owners with potential PEV purchasers. Consumers will value PEV owners' information more than a dealership's information, as they can identify with other users who are not trying to sell them a particular vehicle.

To make the largest impact, a different approach to state incentives for PEV sales should be created.

Dealerships currently face extra costs and possible loss of revenues from purchasing and selling PEVs. To overcome dealership resistance to more aggressively marketing PEVs, stakeholders stressed that financial incentives for dealerships from the state, such as tax credits, could help remove some of the real and perceived barriers.

Incentives for dealerships have the potential to create a more significant impact than incentives to relatively few consumers, and such a system would be easier to manage. Studies have demonstrated that income tax incentives have limited effectiveness on consumers, in large part due to the lag time between purchase and reimbursement. Businesses are more likely to see the advantage of and plan for a tax credit incentive.

8. Topics for Further Investigation

Throughout this project, many questions arose that were outside of its scope. The following are some subjects around EVs and PHEVs that need further investigating:

1. Electric Vehicle Supply Equipment (EVSE)
    - Throughout this project, issues related to charging station siting were frequently brought up. Extensive research still needs to be done on where public charging stations should be installed, who should pay for their installation, and how individuals would be charged for using them. Current EV and PHEV owners who currently charge at home are very interested in how the state and municipalities will be regulating at home charging. Businesses and fleets have a lot of interest in the financial and legal ramifications of installing charging stations.
2. The lifetime of batteries in PEVs in Vermont's weather patterns
    - Dealerships and current EV and PHEV owners alike discussed the possibility that EV and PHEV batteries may not retain their charging capabilities in Vermont due to the varying weather. While research done by OEMs does estimate the lifetime of a battery in cold weather, many questions remain on whether or not these estimates are accurate.
3. Leasing Options
    - As mentioned above, leasing may be a better way for individuals to have PEVs now without having to worry about their resale value later. Currently, most major manufacturers offer lease programs for PEVs. Investigating how leasing programs affect the lifetime cost of a PEV may help individuals who are concerned with their current sticker price.

9. PEV Readiness: General Background

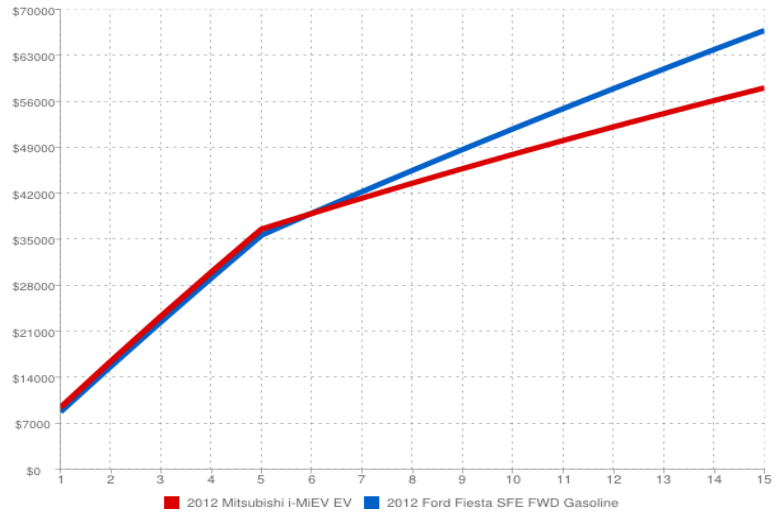
There is a growing literature and resource base for better understanding how PHEVs and EVs will gain acceptance in the automobile marketplace. The findings from the project largely reinforce findings from national research and studies. A summary of those broader findings is included below.

9.1 Opportunities for PEV Deployment

Electric vehicles have many positive attributes and it is undeniable that their presence in the new car market will only grow in the years to come. According to the most recent KPMG Global Automotive Executive Survey, which surveys 200 senior executives from the world's automotive industry, 9-14 million electric vehicles will be registered throughout the world by 2026.[16] As battery technology improves, gas prices increase, and government air quality regulations become more stringent, electric parts within both ICEs and PEVs will increase in importance. In that same survey by KPMG, 54% of the executives surveyed believe that electric component supplies will gain significant importance in the automotive manufacturing value chain.

Even in the present market, electric vehicles present an economical and environmentally sound solution for some consumers. Figure 9-1, from the U.S. Department of Energy's Alternative Fuels Data Center, demonstrates that a consumer could find financial savings through owning an all-electric Mitsubishi i-MEV compared to the ICE Ford Fiesta.

Figure 9-1. Lifetime Cost of Owning a Mitsubishi i-MEV EV Compared to the 2012 Ford Fiesta



Beyond financial savings, there are many aspects of EVs and PHEVs that would entice individuals or businesses to purchase one. PEVs are much cheaper to fuel and operate than ICE vehicles, they produce few to no tailpipe emissions, and they are extremely quiet to operate. In

[16] For more information, see "KPMG's Global Automotive Executive Survey 2012" by KPMG at http://www.kpmg.com/GE/en/IssuesAndInsights/ArticlesPublications/Documents/Global-automotive-executive-survey-2012.pdf

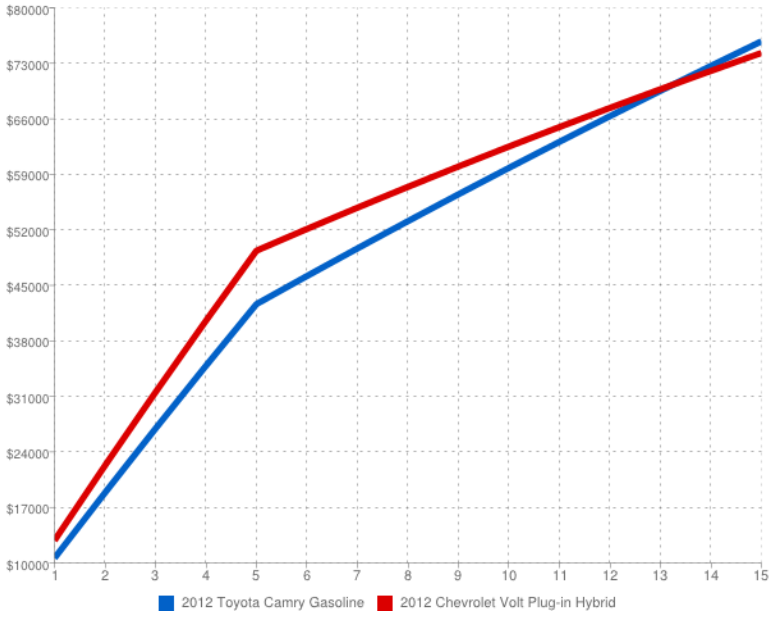
addition, because electricity is a domestically produced energy source, they reduce our country's dependence on foreign oil. For individuals and businesses concerned about the volatile nature of gas prices in the short and long term, PEVs offer an alternative that provides a more predictable basis for calculating fuel and operating costs into the future.

9.2. Barriers to PEV Deployment

Throughout this project, barriers to electric-powered vehicle ownership, use, and purchasing arose. Many of the major issues with EVs and PHEVs are as a result of them being a new technology. These issues include the sticker price of an EV or PHEV compared to an ICE vehicle, as well as inadequate knowledge of these vehicles among consumers.

Battery technology for EVs and PHEVs is still relatively new and very expensive. As a result, EV and PHEV have much higher starting prices than their ICE competitors. One of the biggest barriers to EV and PHEV ownership brought up during this project was the sticker price of these vehicles. As seen in Figure 9-2, even with the fuel savings one would get from owning the PHEV, the Volt is more expensive to own when compared to a Toyota Camry for the first 12 years.

Figure 9-2. Lifetime Cost of Owning a Toyota Camry Compared to a Chevrolet Volt



In addition, there is a lot of misinformation, confusion, and lack of awareness surrounding PEVs. Many individuals spoken to for this project shared information about PEVs that was completely incorrect. There were numerous fleet managers and dealership managers who had experienced PEVs ten or twenty years ago, when the industry was first experimenting with the technology. PEV models of the late 1990s and early 2000s had many technological issues, such as a lack of power, battery problems, and a short life span that left many people angered that they invested in them.

Many aspects of this project highlighted that **education is one of the most important steps to PEV deployment.** When talking to dealerships about how other stakeholders could help them sell PEVs, they regularly brought up education. Many salespeople and managers at dealerships felt that simply getting people to drive was the most important step to educating them.

Due to continued investment in research, PEVs are becoming cheaper and more practical for the consumer. According to three sales managers we spoke with for this project, in the next few years OEMs will develop PEVs that exceed the current models in many areas, which will decrease the resale value of PEVs bought today. Consumers are therefore hesitant to buy a PEV. One solution to this issue would be leasing programs that allow individuals to drive PEVs now without the concern of their future resale values.

10. Summary of Project Accomplishments

In summary, this project disseminated information, created dialogue, and built capacity among targeted groups of stakeholders vital for the mass deployment of PEV in Vermont. The efforts of this project accomplished the following:

- Raised excitement about PEV technology through outreach events and individual interviews.
    - Extremely passionate owners of PEVs were brought together and empowered. Continued efforts by the VTCCC will assist these individuals in becoming a more active stakeholder group by developing an online forum for them to use to share information. Insightful discussions were also held with 19 dealership employees regarding the capabilities of the PEVs currently on the market and other models coming in the next year. In the next year, VTCCC plans to continue to raise excitement through the utilization of dealerships at public outreach events such as the 2012 Odyssey National Alternative Fuel Vehicle Day.
    - Discussions were held with stakeholders in an effort to evaluate their opinions of PEV technology. Through these efforts, information was gathered regarding how these stakeholders currently view PEVs and how they may utilize this technology.
- Gave participants the ability to accurately inform customers and peers of what to expect in the future.
    - Information regarding current and future PEV technology was gathered from dealership and manufacturer representatives.
    - The project's team gained a deep understanding of the challenges each stakeholder faces with PEV deployment, enabling VTCCC to better assist stakeholders in utilizing PEV technology. VTCCC will continue to work with fleets and dealerships to disseminate information regarding the future of PEVs in the state of Vermont.
    - Information was shared with fleet managers regarding current and future PEV technology that their organization could utilize.
- Explained why PEV technology is important.
    - One-on-one conversations were held with fleet managers to discuss why PEV technology is important. Fleet managers were shown or given the DOE Plug-In Electric Vehicle Handbook for Fleet Managers (link found in Section 11 of this paper). A narrative was developed to help inform fleet managers how they could and why they should adopt PEVs.
- Built capacity for this group of stakeholders and VTCCC to be engaged in Drive Electric Vermont planning and activities.
    - The project attempted to assess how stakeholders could assist in the deployment of PEV technology. The project's team spent hours driving around Vermont, talking with dealership managers and salespeople about their experiences with

PEVs, understanding why some dealerships dislike PEVs, and brainstorming ways to increase PEV sales. VTCCC gained invaluable information regarding the buying, selling, and driving of PEVs in Vermont as well as knowledge of how the automotive industry works as a whole.

- This project engaged VADA in VTCCC's and Drive Electric Vermont's efforts in PEV deployment. As a result of this engagement, a relationship was built between VADA and VTCCC. Recently, VTCCC became a member of VADA and will be presenting at their annual meeting.

In conclusion, this statewide project expanded, brought together, and informed a wide range of individuals and organizations on how they can best prepare for PEV deployment throughout Vermont.

11. Educational Materials

There are many great resources available on EVs, PHEVs, and electric-powered vehicle technology. The table below is a list of resources compiled for this project.

Educational Materials

General Information			Target Audiences				
Source	**Title**	**Location**	**EV and PHEV Owners**	**Fleets**	**General Consumers**	**Dealerships**	**Legislatures**
DOE Resources	DOE Plug-in Electric Vehicle Handbook for Public Charging Station Hosts	http://www.afdc.energy.gov/pdfs/51227.pdf		X			X
	DOE Plug-in Electric Vehicle Handbook for Consumers	http://www.afdc.energy.gov/pdfs/51226.pdf	X		X	X	
	DOE Plug-In Electric Vehicle Handbook for Electrical Contractors	http://www.afdc.energy.gov/pdfs/51228.pdf	X	X			X
	DOE Plug-In Electric Vehicle Handbook for Fleet Managers	http://www.afdc.energy.gov/pdfs/pev_handbook.pdf		X			X
Industry	My Electric Car Forums	http://www.myelectriccarforums.com/	X	X	X	X	X
	Auto Blog Green	http://green.autoblog.com	X	X	X	X	X
	Treehugger's Transportation Blog	http://www.treehugger.com/transportation/	X	X	X	X	X
	Clean Technica's Transportation Blog	http://cleantechnica.com/category/transportation-tech/cars-transportation-tech/	X	X	X	X	X

	Plug-In America	http://www.pluginamerica.org/	X	X	X	X	X
	Electric Drive Transportation Association	http://www.electricdrive.org/	X	X	X	X	X
	Green Car Congress	http://www.greencarcongress.com/	X	X	X	X	X
	Green Car Reports	http://www.greencarreports.com/news	X	X	X	X	X
Commercial	Chevrolet's Official Volt Blog	http://www.chevroletvoltage.com/index.php/about-us.html	X	X	X	X	X
	Nissan's Official Leaf Blog	http://www.nissanleafdrivers.com/	X	X	X	X	X
	Tesla Blog	http://www.teslamotors.com/blog	X	X	X	X	X
Other	Drive Electric Vermont Website	http://driveelectricvt.com/	X	X	X	X	X
	The Vermont Comprehensive Energy Plan	http://publicservice.vermont.gov/2011%20CEP_Volume%201.pdf	X	X	X	X	X