



Richmond Electric Vehicle Initiative

Electric Vehicle Readiness Plan

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Executive Summary

Setting the Stage: The Richmond Region's Case for EVs

Adoption of electric vehicles (EVs) is becoming a reality in the Richmond Region and throughout the Commonwealth of Virginia. The region is well-positioned geographically and economically to participate in this emerging transportation technology. Embracing EV use in Virginia will assist statewide efforts to reduce vehicle emissions, increase energy independence, and generate positive economic development for the Commonwealth.

Virginians spend \$13 billion each year on petroleum for transportation. Electricity represents a less expensive, cleaner, and locally generated energy source that also contributes to new economic advantages. The energy industry research group PRTM Management Consultants has estimated that vehicle electrification could represent more than \$250 billion in economic development opportunities worldwide by 2020. This estimate considers growth in electricity generation and distribution, grid and infrastructure investments, batteries and their components, vehicle sales, and associated advertising and marketing services.

The Opportunity

Virginia's economy is already benefiting from the electric vehicle value chain. Local companies make batteries, battery components, motors, charging stations, and entrepreneurial wireless charging technology. Companies in Virginia also design, manufacture and deploy electric vehicles, and convert vehicles to plug-in hybrids and battery electric vehicles. Virginia entities are researching vehicle conversions, assessing charging capacity, reviewing financial strategies, and considering roles in jump-starting vehicle adoption and infrastructure deployment to further benefit our local economy.

The Richmond Region is at the forefront of emerging transportation modes and technologies, and is particularly supportive of EVs. For example, Ford Motor Company selected Richmond as one of the nineteen US cities to launch its first electric car, the Focus Electric; and the area has seen many other EVs come to market since then. Dominion Virginia Power is piloting time-of-use rates to encourage off-peak EV charging.

Barriers

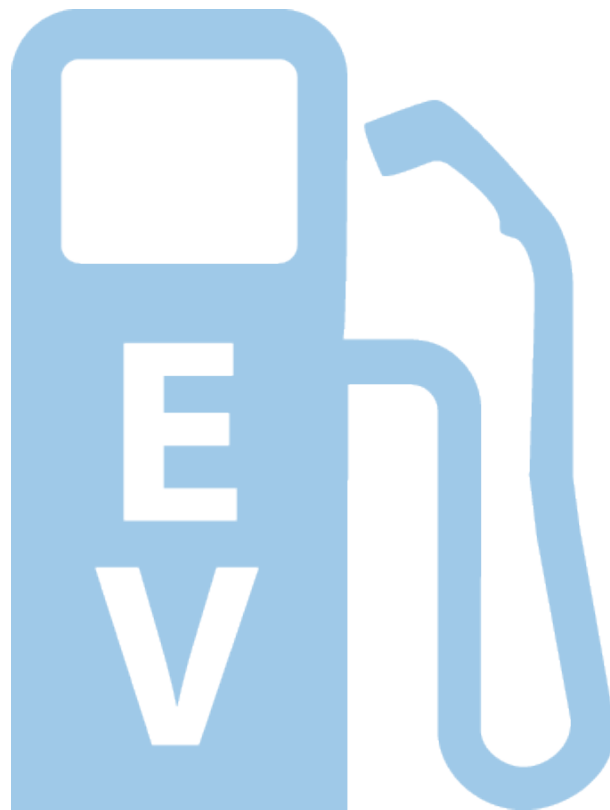
Barriers to the adoption of EVs include misconceptions about vehicle technologies, the need for more EV charging infrastructure, and the need for common guidelines that support an easily understood, regional deployment of EV infrastructure. Through the Richmond Electric Vehicle Initiative (REVi), teams formed to address these barriers. After researching existing conditions, the teams analyzed the technological, regulatory, and educational needs to implement this plan.

The Richmond Region's EV Readiness Plan

Richmond's commitment to advancing emerging, cleaner fuels is evident through its participation in the US Department of Energy's *Clean Cities Community Readiness for Plug-In Electric Vehicles and Charging Infrastructure* program. The REVi plan for plug-in EVs and charging infrastructure details a pathway for advancing the region as an attractive and sustainable market for EV technology and demonstrates the progress made to date.

The REVi plan first sets the context for the electric vehicle market in the Richmond area and then addresses five main topics:

1. A regional plan and underlying strategy for deployment of EV charging stations.
2. Zoning, codes and permitting tools identified to foster deployment of electric vehicles provide safety and convenience to the public.
3. An analysis of existing and potential policies.
4. A report on pilot programs and other opportunities that documents recent work completed, work underway, and new ideas for action.
5. Documentation of over a dozen approaches to education and outreach already undertaken and recommendations for future outreach and training.



Key Recommendations

Organizational

- Facilitate an advisory board of representatives from organizations with a stake in EV and infrastructure deployment. The advisory board provides technical expertise and assists with promotion of plan recommendations.
- Facilitate and engage a diverse list of partner organizations to strategize and provide input throughout all planning sectors.

Codes, Permitting and Site Installation

- Support creation of a basic network of EV charging stations throughout the Richmond Region.
- As a building permit requirement for new parking facilities, require that a percentage of the parking spaces include EV charging stations or conduit for future EV charging stations. The percentages would vary according to land use type as detailed in the REVi report.
- Concentrate higher numbers of EV charging stations where most population density, development, and jobs will be located.
- Strive for common regional zoning and development guidelines using examples found in this report.
- Adopt unified signage for locating and identifying charging stations, and regulating EV parking.

Policy and Incentives

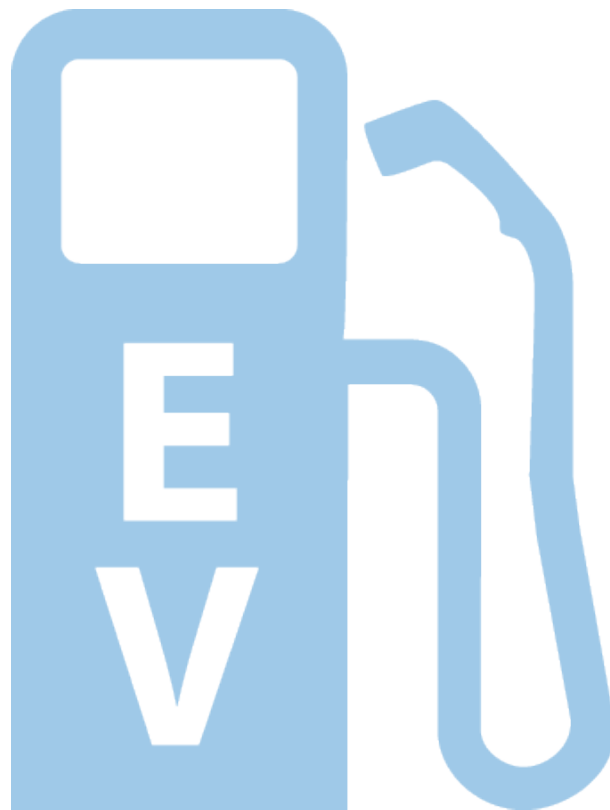
- Support tax credits that advance EV and infrastructure purchases and deployment.
- Encourage adoption of regulations that enable public and private EVSE providers to charge for their service.
- Support HOV lane exemptions for EVs.
- Support regional funding of publicly accessible EVSE in key locations around the Richmond metropolitan area.
- Include the cost of EVSE materials and installation in vehicle financing arrangements from vendors.
- Support time-of-use charging and other special rate strategies that advance EV deployment.

Education and Outreach

- Create and carry out a coordinated outreach strategy to inform and motivate people to adopt the emerging technology.
- Target outreach to businesses and government agencies to promote installation of workplace charging stations.
- Utilize social media to create a community of advocates.
- Establish an earned media campaign including public events and testimonials from early adopters to take the EV message to the public at-large.

- Establish and promote training programs for the automotive industry, first responders, corporations and the general public.
- Market the EV message by creating a local video, handouts and other materials to present at meetings and on public access services including cable networks and Internet.

As this Clean Cities sponsored project concludes, our stakeholder coalition is ready to move forward using the information developed and promote action on these key recommendations. The Richmond Region is the first area in Virginia to develop an EV deployment plan. It is the hope of REVi that these recommendations become a framework that benefits localities across the Commonwealth while they enact their own unique plug-in electric vehicle and infrastructure planning.



Project Overview

A consortium of organizations in the Richmond, Virginia region established the Richmond Electric Vehicle Initiative (REVi) with the goal of fostering full-scale EV adoption. The Greater Richmond Region is at the forefront of emerging transportation modes and technologies, and is particularly supportive of EVs. This is evident through REVi's pursuit and award of the US Department of Energy Clean Cities' Community Readiness and Planning for Plug-in Electric Vehicles and Charging Infrastructure project, which has funded the work presented in this document. This community readiness and planning project is intended to facilitate the adoption of EVs and associated infrastructure in the Richmond Region and to serve as an example for other communities. The area covered by the REVi project is shown in Figure 1, as well as the Crater Planning District localities.



Figure 1: Area Covered by the Richmond Electric Vehicle Initiative

The resulting work has advanced planning for the Richmond Region as an attractive and sustainable market for EVs, established the educational groundwork for EV adoption, and developed a regional strategic plan that identifies and fosters policies to expedite EV infrastructure implementation specific to the Richmond Region.

EV deployment in Virginia will assist statewide efforts to reduce vehicle emissions, increase energy independence, and generate positive economic development for the Commonwealth. This plan is a critical milestone in moving the Commonwealth one step closer to a balanced energy portfolio for transportation.

Process Overview

This project was made possible by funding through the US Department of Energy's Clean Cities Program. The Virginia Department of Mines, Minerals and Energy was the prime award recipient, with Virginia Clean Cities serving as the award administrator and overall program manager. A nine-member Advisory Board focused on program goals while several working groups and technical advisory groups addressed plan development.

The program assembled significant partnership. It started with over 50 engaged organizations and increased substantially throughout the project. Stakeholder groups participated in many forums to help conduct studies and analyses, as well as plan and implement project objectives. Localities represented in REVi include the Town of Ashland, the City of Richmond, and the counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent and Powhatan, as defined by the Richmond Regional Planning District Commission. Other nearby localities, including the Crater Planning District Commission municipalities, participated in project efforts.

Advisory Board

Virginia Clean Cities created a REVi Advisory Board, bringing together representatives from the Department of Mines, Minerals and Energy, City of Richmond, Dominion Virginia Power, Richmond Regional Planning District Commission, J. Sargeant Reynolds Community College, the Sustainable Transportation Initiative of Richmond, Virginia Commonwealth University and Urban Grid Solar. This advisory board facilitated achievement of program goals by providing input on key success factors, program direction and decision points.

Working Groups

Members of the REVi Advisory Board also led the four project working groups, described below.

Codes and Permitting Working Group:

This working group, convened by the Richmond Regional Planning District Commission (RRPDC), addressed potential barriers associated with the installation of charging stations, specifically related to building codes, standards and processes. Their contributions included permitting process documentation and codes recommendations.

Sites and Installation Working Group:

The RRPDC led this working group. It focused on the issues and tasks necessary to install a charging station, from the technical to the managerial. The working group also participated in planning for future EV infrastructure.

Education and Training Working Group:

J. Sargeant Reynolds Community College (JSRCC) led the Education and Training Working Group. The purpose of this group was to manage the knowledge gained through this project and to disseminate it to appropriate partners, stakeholders and the general public through various channels. This group ensured that an accurate and consistent message was presented at all times to dispel misinformation and to inform the public about EVs. They also assisted with specialized training and education, in coordination with JSRCC, for mechanics, first responders and private organizations.

Policies and Incentives Working Group:

This working group was led by Dominion Virginia Power. The group developed a list of relevant policies and incentives (both monetary and non-monetary) that have the capacity to promote EV deployment. They then provided research and analysis for those with the greatest potential for implementation.

Technical Advisory Partners:

Technical advisory partners included EVSE and vehicle manufacturers, component manufacturers, third party providers, utility regulatory authorities, fleet managers, and many government agency partners.

The Electric Vehicles

This report focuses on plug-in EVs, examples of which are shown in Figure 2 alongside a hybrid electric vehicle (HEV). EVs include both battery electric vehicles (BEVs) that run entirely on electricity and plug-in hybrid electric vehicles (PHEVs) that operate using both an internal combustion engine and an electric motor.

While this document primarily addresses planning for full sized electric vehicles, smaller Neighborhood Electric Vehicles, or Low Speed Electric Vehicles (LSVs) represent another option. These vehicles do not need additional robust charging infrastructure. Normal 120-volt circuits are generally sufficient. They serve ideally for many specifically defined tasks such as parking enforcement, security, downtown shopper shuttles, and maintenance in closed areas such as college campuses, hospital grounds, and apartment complexes. Many of these tasks are currently served by old pickup trucks and vans that are high-emission vehicles. Replacing these with small electric vehicles may have a quick payback time and make a significant reduction in carbon footprint. Certain individuals are also likely to consider LSVs instead of full size cars for in-town commuting.

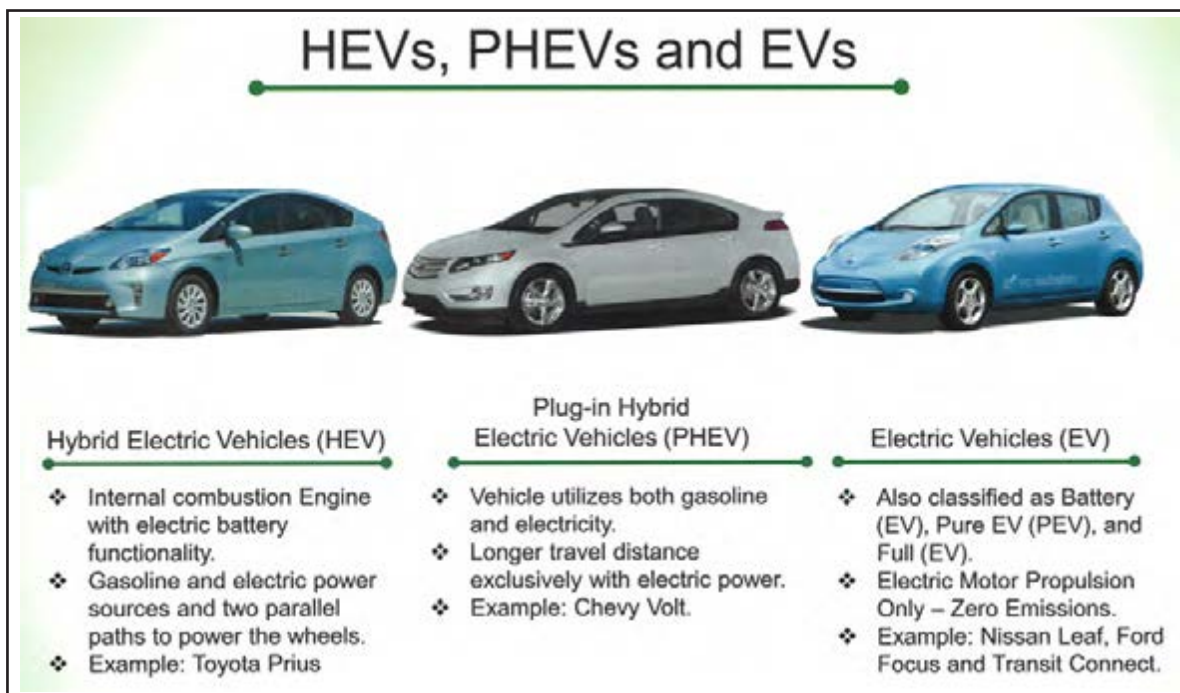


Figure 2: Electric Vehicle Types

EV Charging Infrastructure

Level 1 and Level 2 electric vehicle supply equipment (EVSE) are currently the most prevalent means for charging EVs in the Richmond area. Figure 3 shows this type of equipment along with an example of a DC Fast charger.



Figure 3: Electric Vehicle Supply Equipment

AC Level 1 charging utilizes a common 120-volt circuit and grounded electrical receptacle (NEMA 5-15R or 20R), while AC Level 2 charging uses a dedicated 208 to 240-volt circuit. Both AC Level 1 and Level 2 equipment supply power to a charger located on board the vehicle. Both Level 1 and Level 2 charging use a Society of Automotive Engineers (SAE) standard J1772 connector to attach the EVSE to the vehicle.

DC fast charging (both levels 1 and 2) has a dedicated direct current (DC) circuit to provide power from an off-board charger to the electric vehicle. Most models of EVs are capable of DC fast charging currently utilize a Japanese "CHAdeMO" connector to supply power to the vehicle. The SAE recently adopted a different standard connector for the US. Three major US automobile manufacturers and five manufacturers from Europe plan to support this "J1772 combo connector" (Ponticel, 2012).

Additional information on these standards is given in Table 1 (SAE Hybrid Committee, 2011):

Charging Type	Power	BEV Charging Time
AC Level 1	120V single phase	17 hours ¹
AC Level 2	240V single phase up to 80 Amps	3.5-7 hours ¹
DC Level 1 DC Fast Charging	200-450Vdc 3 Phase up to 80 Amps	1.2 hours ¹
DC Level 2 DC Fast Charging	200-450Vdc 3 Phase up to 200 Amps	20 minutes ¹

¹Charging time depends on battery size, on-board charging capacity and starting battery charge level.

Table 1: SAE Standardized Charging Levels

EV Charging Scenarios

Home Charging

Most EV charging is expected to occur at home. A recent quarterly report from the EV Project indicates that the Nissan Leafs associated with the project are being charged at residences between 70 percent and 90 percent of the time, with the variability based on geographic region.

Home charging creates the ability to charge at off-peak rates, such as overnight. The potential economic benefits to drivers are likely to encourage home charging in the REVi study area. Dominion Virginia Power, the regulated investor-owned electric utility that provides electric service to the majority of the Richmond Region, is offering two experimental time-of-use rates for residential EV charging. Both rate options are designed to encourage off-peak charging in an effort to avoid contributing to peak load and overloading local distribution circuits.

One rate option, Schedule EV, is for EV-charging only and requires a separate meter. A customer can recharge his or her EV for as little as 54 cents per night for a 40-mile commute. The second rate option, Schedule 1EV, is a whole-house rate that relies on a single meter to measure all electricity usage associated with the entire house. A customer can recharge an EV for as little as 51 cents per night for a 40-mile commute.

Workplace Charging

Most vehicles spend the majority of their time away from home parked at a place of employment, often for eight to ten hours per day. Although not a replacement for publicly accessible EVSE, expanding workplace charging availability may help speed adoption of EVs. Vehicles sitting unused for several hours at a time provide an excellent charging opportunity. Furthermore, longer charging periods increase the likelihood that Level 1 charging will suffice. Many employers may have existing 120-volt receptacles and power capacity available, but even the installation of new circuits and receptacles should be considerably less expensive than installing Level 2 EVSE. REVi has a special interest in supporting the growth of workplace charging.

Public Charging

Public EV charging needs to be located at destinations where people typically spend one or more hours. Public charging destinations can be broken into several categories:

- Transportation destinations such as public parking structures, airports, park-and-ride facilities, and multi-modal centers
- Entertainment and shopping destinations like shopping malls, movie theaters, museums and civic centers
- Recreation destinations such as public parks, mixed-use sports complexes, stadiums, trail facilities, marinas and golf courses

DC Fast Charging

For EVs traveling outside their typical battery range, DC fast charging provides convenience and fueling assurance. Typical applications for DC Fast Charging include but are not limited to:

- Conventional fueling stations
- Vehicle fleet centers
- Automotive sales dealerships
- Travel centers and truck stops
- Industrial parks
- High-density residential areas
- Commercial and office centers
- Government and institutional facilities

Barriers

One of the single greatest barriers to EV adoption in the Richmond Region is public misconception. Experiences at outreach events and opinion polls continue to show that more education is needed. The general driving public is underexposed to positive information about benefits of driving an EV. Misconceptions related to the following are prevalent in the region:

- Upfront costs are incorrectly over-estimated, primarily because costs are rapidly dropping. Many people are also unaware of current tax incentives.
- While most trips in the region fall well within the battery range of an EV, range is a concern.
- People who have not test driven an EV can have negative attitudes about drivability.
- The technology can be misunderstood causing some to be wary of safety and performance.

Apart from misconceptions, the need for a basic network of EV charging stations throughout the greater Richmond area represents a major barrier to adoption. Drivers will feel more comfortable with a safety net of charging stations to accommodate a wide variety of trip locations and types.

Finally, deployment will be advanced by common systems created by codes and policies that support regional uniformity. The comfort level of consumers will rise with common signage, site layouts, and regulations that govern behavior. For example, is parking for EVs exclusively for charging? Will an internal combustion engine (ICE) vehicle be fined or towed?

EV Deployment in Richmond Area

As of September 2012, Department of Motor Vehicles (DMV) records showed 56 EVs and PHEVs registered in the Richmond Region. Statewide, the DMV counted 865 EVs and PHEVs during the same period. Regional growth in EV registrations for February through September 2012 amounted to 400 percent. State growth is further confirmed by January DMV registration numbers showing over 1,000 EVs and PHEVs statewide, indicating the importance of addressing EV infrastructure needs.

The following section uses current regional socioeconomic data, regional growth plans, and existing hybrid and EV registrations to predict the distribution of EVs in the Richmond Region over time. It discusses factors about EV technology, trip types, and driving behavior to plan the needed EV charging infrastructure that supports deployment.

Existing EV Infrastructure

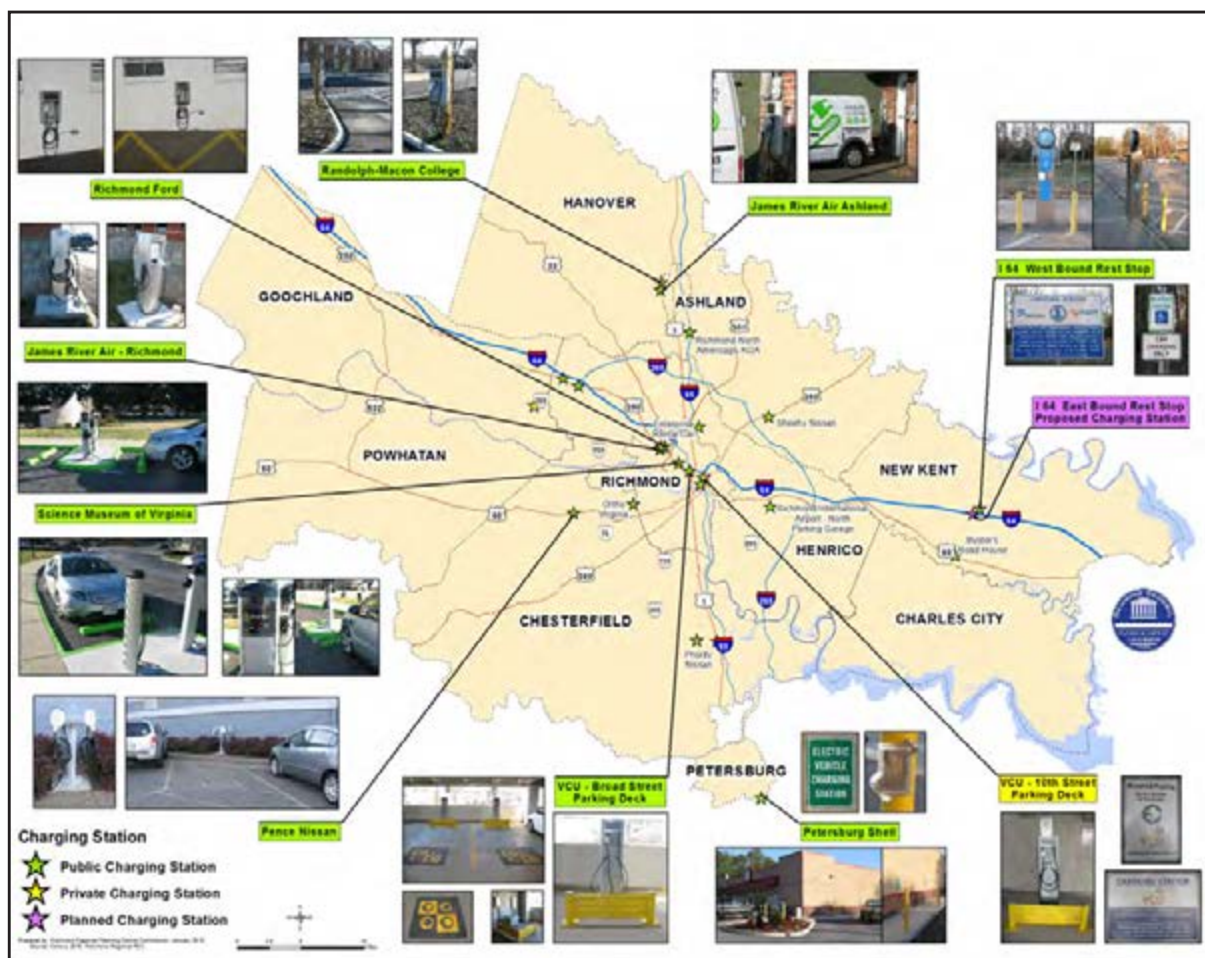


Figure 4: Existing EV Charging Stations

An April 2012 survey of statewide EV charging stations from the US Department of Energy Alternate Fuels & Advanced Vehicles Data Center website shows that there were 146 public and private EV charging station locations statewide. Each EV charging station has “charge points” representing the number of accessible energy transfer outlets at any physical station location. The Richmond Region and Crater Region have approximately 20 EV charging stations with about 28 charge points (See Figure 4).

Plans for EV Infrastructure Deployment

According to 2010 records, approximately 1 million vehicles were registered in the REVi study area, of which over 700,000 were passenger vehicles. If five percent of passenger vehicles were to run on electricity, that would amount to over 35,000 EVs.

A basic network of EV infrastructure in the REVi study area is the first priority in planning infrastructure deployment. That is, the public needs to feel safe about the technology and have basic access to charging. Next, deployment plans need to address the accelerating rates of EV adoption and concentration of EV charging stations where people are most likely to recharge. Initial Virginia EV planning suggests that most charging events will occur in residential locations, followed by the workplace and public settings, respectively.

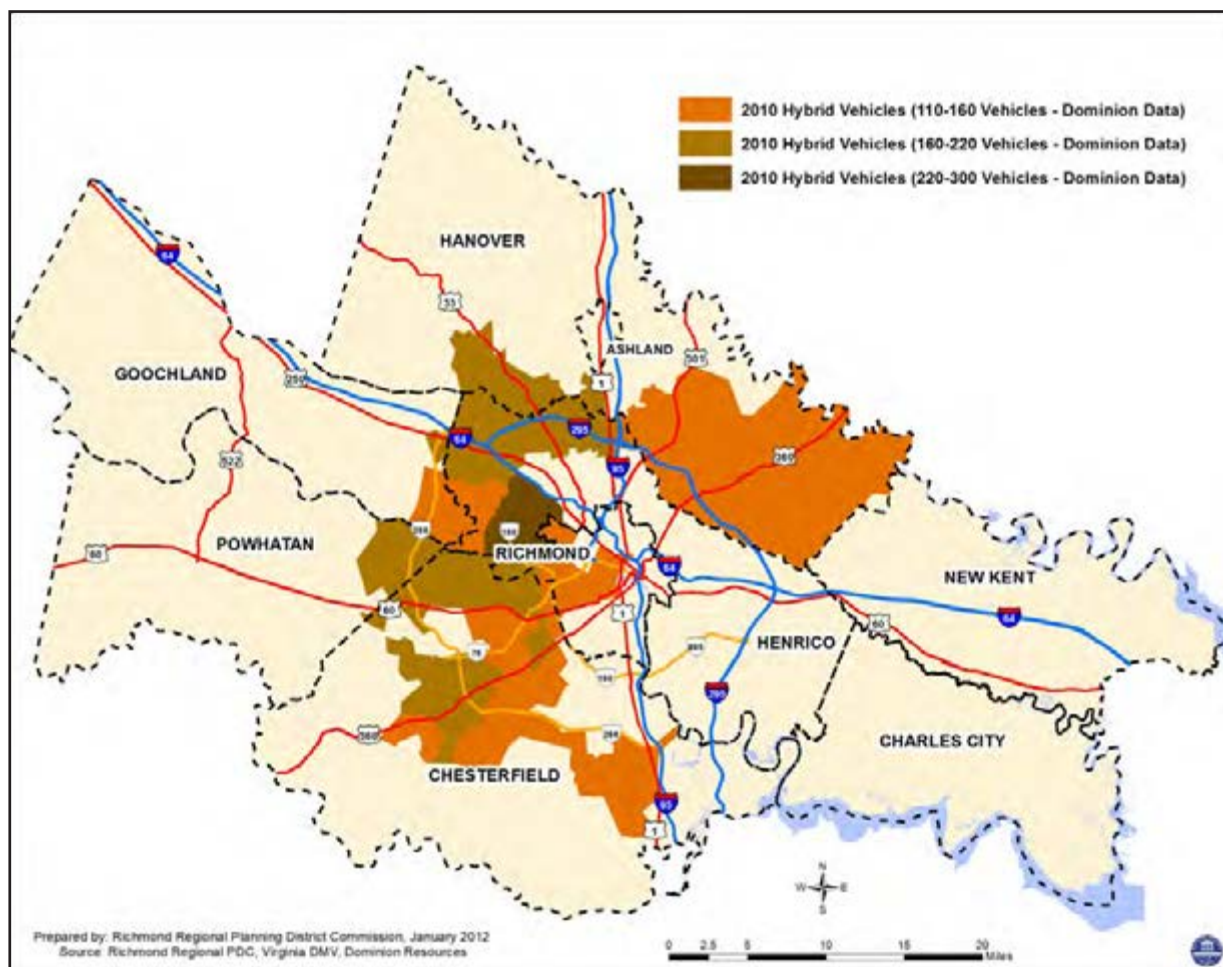
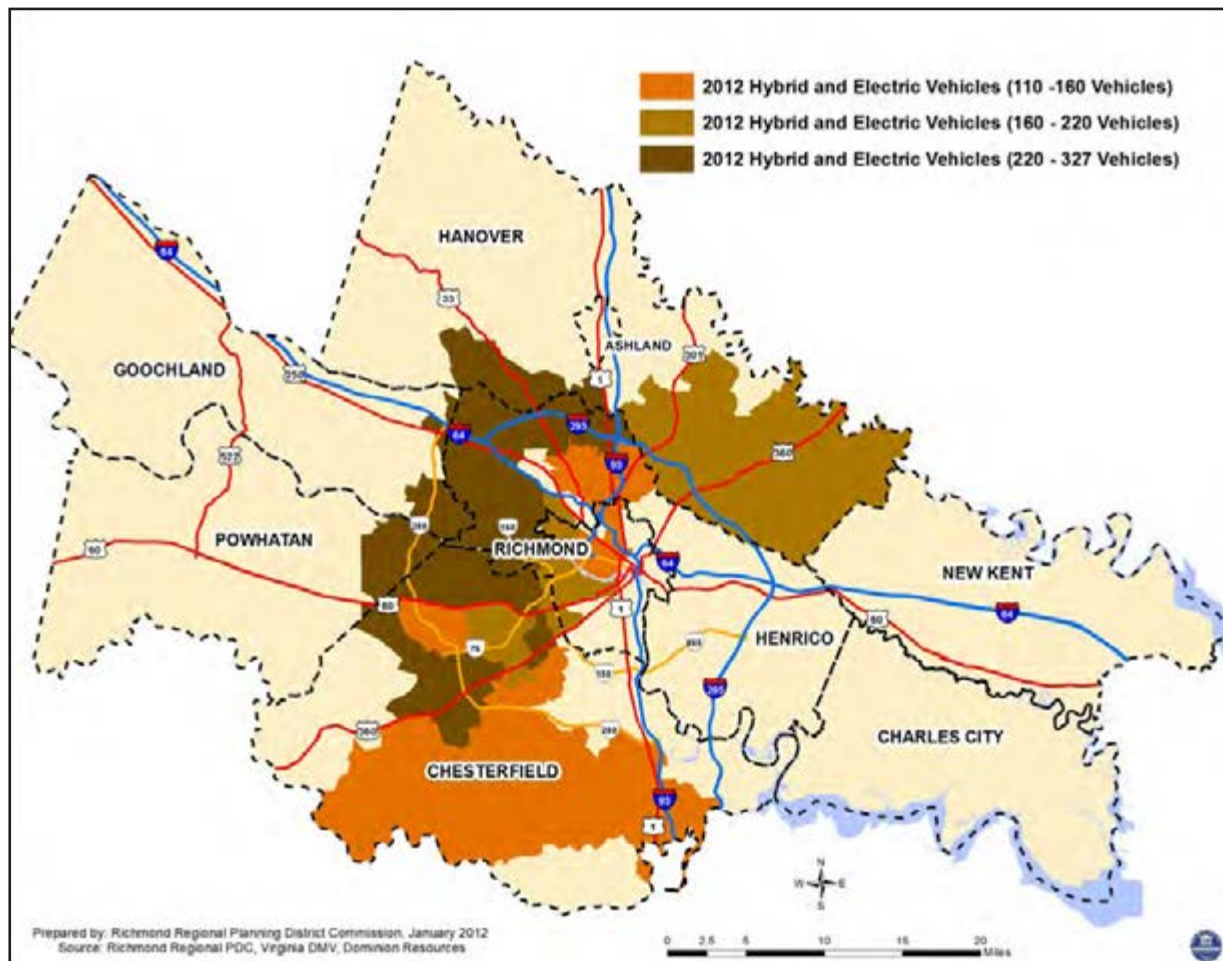


Figure 5: Year 2010 HEV Registrations

This analysis uses demographic data and vehicle registrations for hybrid vehicle owners to determine concentrations of likely EV purchasers. Hybrid vehicle customers represent a demographic group that is familiar with EV technology and would likely purchase another energy efficient vehicle – more so than a conventional ICE vehicle owner. Therefore, the REVi team obtained Year 2010 HEV registration data from the Virginia DMV and mapped concentrations of HEV owners as shown in Figure 5.

Data from September 2012 HEV registrations combined with PEV registrations show an increasing geographic spread of EV and HEV ownership that is still concentrated in suburban areas north, east, west, and southwest of the downtown area as shown on Figure 6. In zip codes with the highest concentrations of HEVs, 2012 DMV data shows an increase of HEV by approximately 129 percent between February and September. For EVs and PHEVs, the region saw an increase of 400 percent over the same time period.



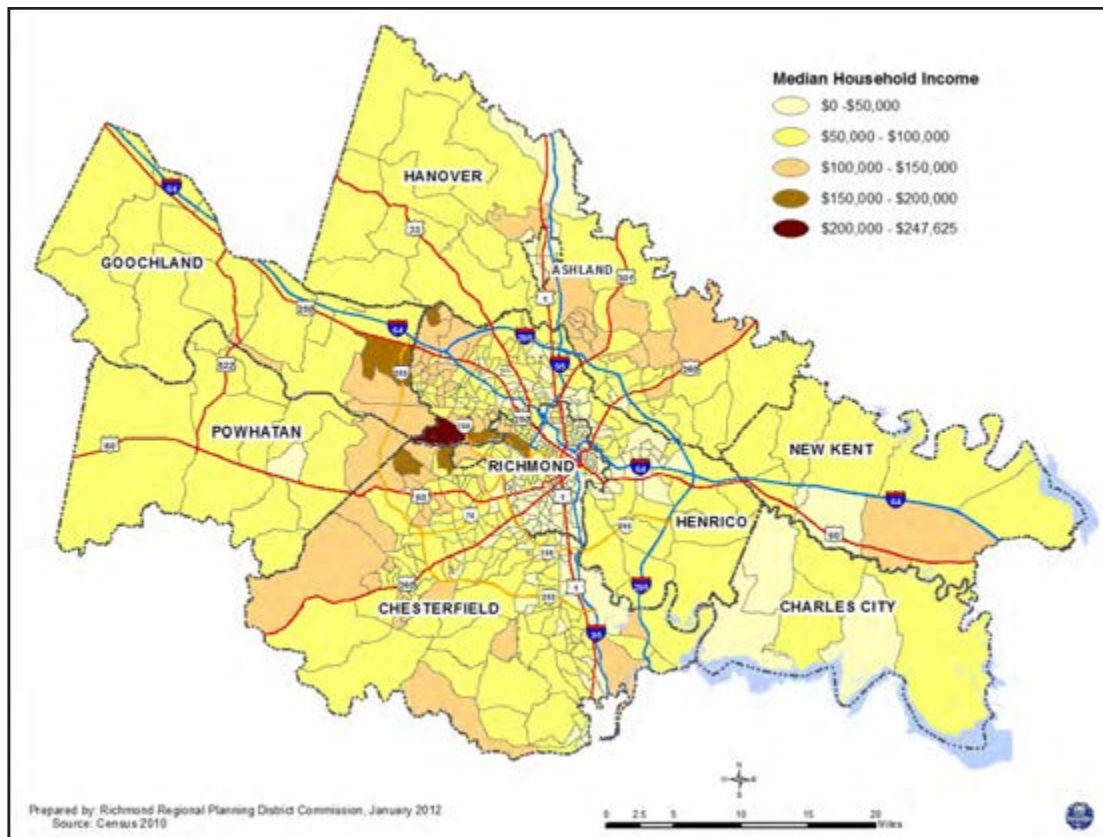


Figure 7: Regional Median Household Income

As the EV market matures over the next 10 years, factors such as lower battery costs, higher numbers of used EVs, and the economic savings of electric propulsion are likely to spread adoption more evenly throughout the region.

Population and Growth

While most owners will charge their EVs at individual homes during evening hours, charging infrastructure also needs to be provided at the workplace, development centers and population centers.

The RRPDC used 2010 US Census data to identify population concentrations and a 2011 socioeconomic data analysis to identify relationships between population density and development areas with high employment. The socioeconomic data analysis defines Regional Development Centers using 2008 base year population and employment data recorded by Transportation Analysis Zone. Data shows that the highest regional population concentrations (1,998 to 9,989 total population per Transportation Analysis Zone) are within five miles of an employment development center and 15 miles to 25 miles of all high employment areas.

Publicly available EV charging stations should initially be concentrated in the development areas and population centers shown in Figure 8. However, a basic widespread deployment throughout the REVi study area will be necessary to sustain long-term growth. Plans for EV infrastructure should consider growth projections that suggest expansion of the West Creek and Innsbrook development areas and new development centers to the north, east and west of the city, as shown in Figure 9.

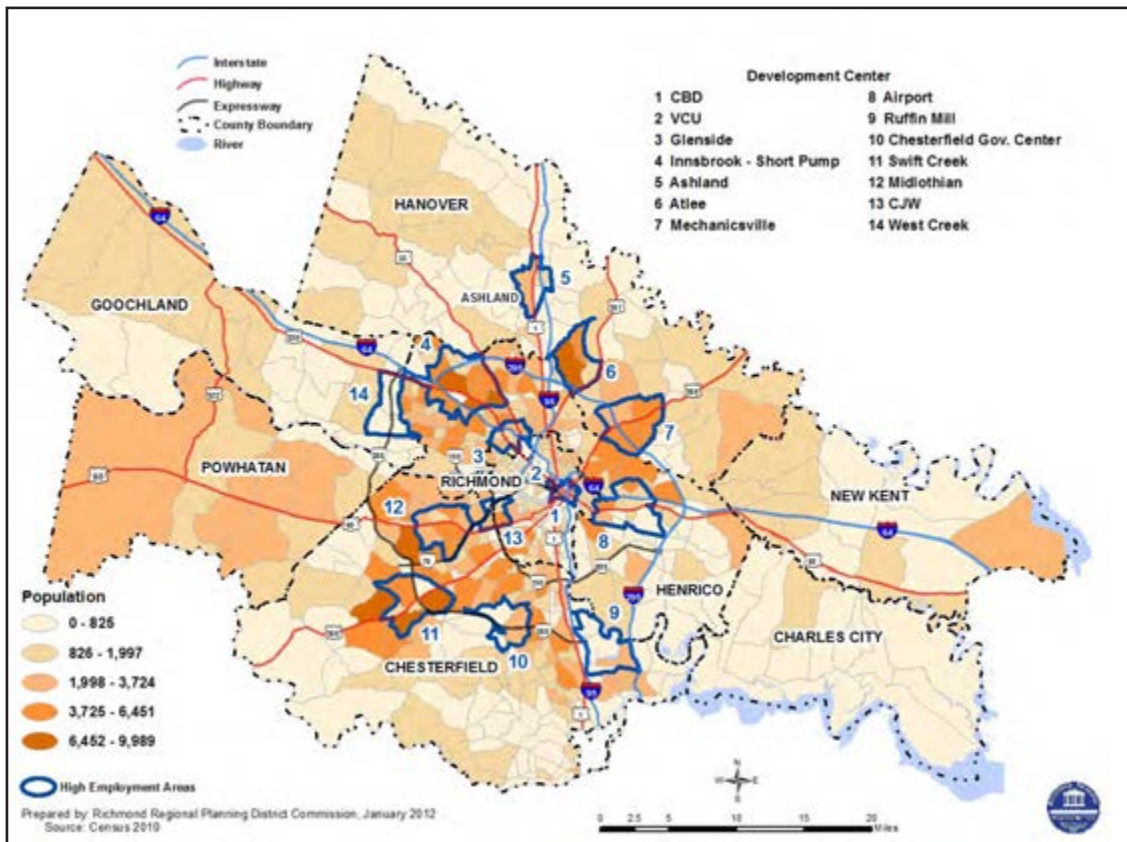


Figure 8: Regional Population Density and Development Centers

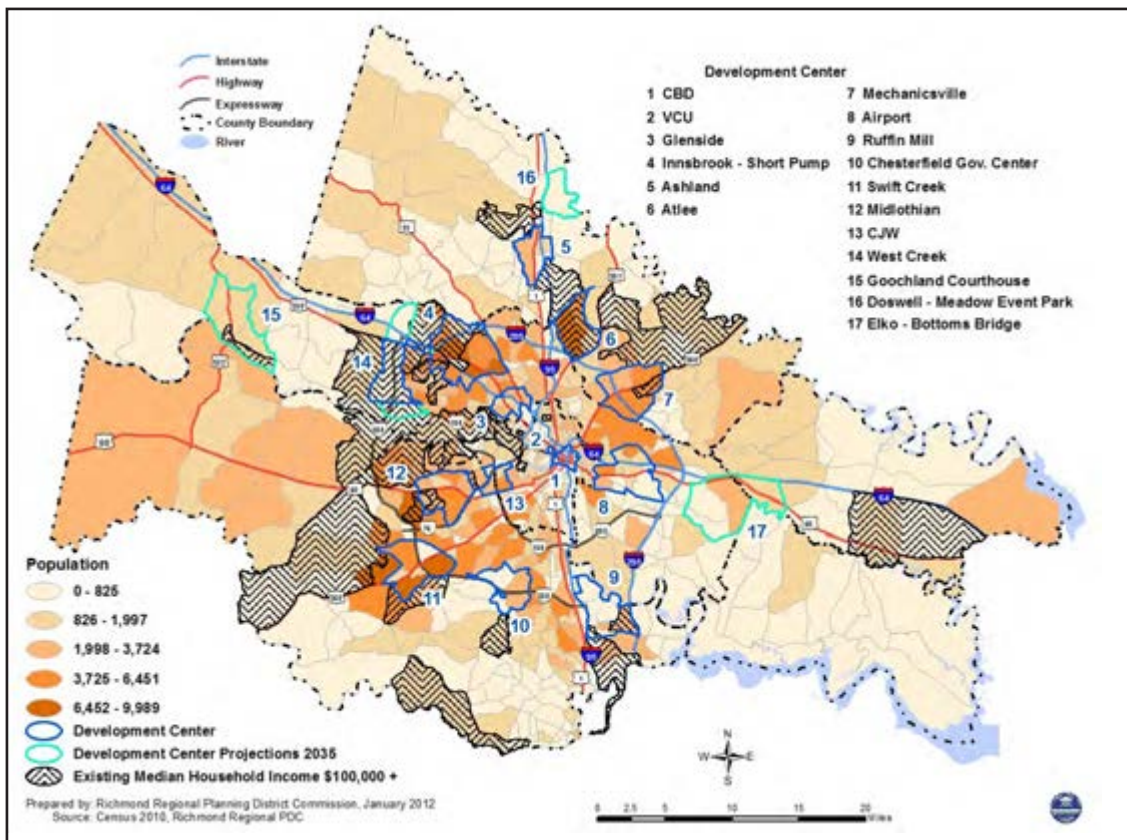


Figure 9: Future Development Centers Compared with Existing Population and Development Centers

Based on the analysis presented by the RRPDC, initial concentrations of EV ownership and infrastructure growth is anticipated to occur in the northeast region (central Hanover County) of the Richmond Region, extending westward to include western Henrico County, eastern Goochland and Powhatan counties, and central and southeast Chesterfield County. This area forms an “electric vehicle crescent” that also encompasses the center of the City of Richmond, Virginia Commonwealth University, the near west end of Henrico County and the Town of Ashland (see Figure 10). Residential charging, workplace charging, and publicly available charging are all expected to concentrate in these places. Secondary EV growth areas are projected to concentrate in eastern New Kent and Hanover counties, northwestern Henrico County, northern, western and southern Chesterfield County and central Goochland County along the Route 6 corridor. Eventually, EV adoption should spread more evenly throughout the Richmond Region.

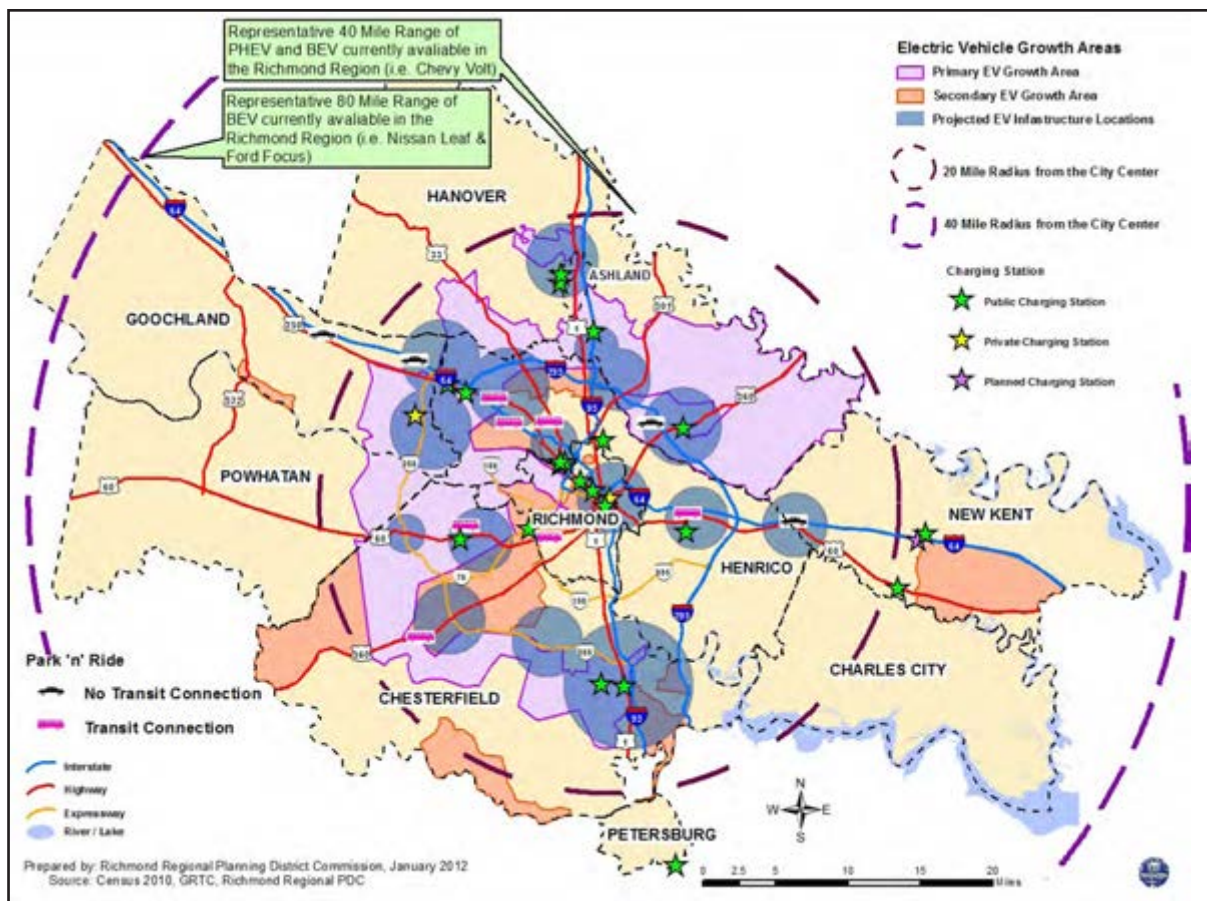


Figure 10: Projected EV Growth Areas and Infrastructure Locations

A survey from the German Chemnitz University of Technology concludes that a comfortable range to offset “range anxiety” is 80 percent of the vehicle’s specified battery range. An EV with a range of 100 miles would translate to an anxiety-free range of 80 miles. Based on this definition of comfortable range, a majority of the Richmond Region is accessible to EV owners using a single charge and therefore range is not a real concern for the Richmond Region. Nonetheless, a basic network of EV charging stations will be needed throughout the region to support a wide range of trip purposes using electric propulsion. This can be accomplished through charging at the workplace or in publicly available locations. Delays in the deployment of a network of charging infrastructure may slow the adoption of EVs. Based on data shown in Figures 5 through 9, estimated concentrations for deployment of EV charging infrastructure is shown in Figure 10.

Zoning, Codes and Permitting to Advance EV Deployment

This section addresses the following objectives to comprehensively review, plan and advance EVs and infrastructure within the region:

- Review regional codes to assess the readiness necessary to deploy EV infrastructure and define solutions to remove any barriers.
- Establish a consistent regional approach to facilitate the deployment of EV infrastructure by preparing ordinance and development guidelines, reviewing permitting and inspection processes, developing a regional EV sign package, and creating EV infrastructure site design templates.
- Use this Plan to coordinate with the Richmond Area Metropolitan Planning Organization (RAMPO) for the inclusion of EV infrastructure in the region's long-range transportation plan as well as other regional plans and programs.

Zoning, codes and permitting directly influence the installation of EVSE. The associated rules and regulations are generally developed and enforced at the local level, which can present a challenge to any effort attempting to facilitate widespread infrastructure deployments. Zoning regulations typically dictate under what conditions certain types of EVSE may be installed. For example, DC Fast Charging systems designed for public access may not yet be allowed in areas zoned as low-density residential or agricultural.

National, state, and local codes all influence the installation of EVSE. Codes are primarily concerned with safety. However they can also include recommendations meant to reduce cost and/or improve efficiency. For example, it may be prudent to recommend that applicable building codes include a provision suggesting that all new businesses pre-wire their facility for future installation of EVSE.

Permitting for the installation of EVSE would typically involve an administrative process to protect safety, existing infrastructure, and other public concerns. The permitting process usually includes an inspection to ensure relevant codes and standards have been met. Permitting fees and processes vary by locality. The City of Richmond is a leader in permitting as they are deploying a fully online permitting program accessible from the City's website. This allows for rapid and efficient EVSE permitting, and the model can be followed elsewhere.

Zoning Guidelines

Zoning ordinances in the Richmond Region do not currently have guidelines that address or restrict EV charging. In an effort to address the necessity of new guidelines, the RRPDC developed the following approach. The guidelines are meant to assist localities in the Greater Richmond Region in developing EV zoning practices for a full deployment of EVSE.

Table 2 shows generalized zoning classifications that can be tailored to a jurisdiction's specific zoning classifications.

Zoning District	Level 1 AC Charging	Level 2 AC Charging	DC Fast Charging
Agricultural	P	P ₁	P ₂
Rural Residential 1	P	P ₁	P ₂
Rural Residential 2	P	P ₁	P ₂
Rural Residential 3	P	P ₁	P ₂
Low Density Residential	P	P ₁	PP
Medium Density Residential	P	P ₁	PP
High Density Residential	P	P ₁	P ₂
Mixed Use	P	P	P ₂
Commercial/Office	P	P	P
Institutional	P	P	P
Industrial	P	P	P

Table 2: Generalized Zoning Classifications

Key

P - Use is always permitted.

P₁ - Allowed only as an accessory to the principal outright permitted use.

P₂ - Local jurisdictions may choose to allow DC Fast Charging stations as an outright permitted use or adopt development standards applicable to high-density residential, mixed-use residential or other zoning districts.

PP - Use is not permitted but should be considered.

Local jurisdictions' zoning ordinance requirements can predetermine the locations for EVSE as an outright permitted use or adopt development standards permitting the conditional use for EV charging.

Building Code and Permitting Compliance

Building Permit Recommendations

One key approach to ensuring an adequate EV infrastructure is to recommend new construction or major alterations of existing development to include a minimum number of EV parking spaces as part of building permit compliance. These EV parking spaces could be either prepared for future EVSE by installing conduit or installing EVSE as part of construction. Table 3 presents recommended guidelines for a minimum number of EV parking spaces as a percentage of the total minimum required parking spaces for different types of development. These recommendations were derived from Leadership in Energy and Environmental Design (LEED) guidelines for alternative fuel vehicles parking spaces and fuel stations.

Land Use Type	Recommended EV Parking Spaces as a Percentage of Minimum Required Parking
Multi-Unit Developments	5%
Lodging	3%
Retail and Restaurants	1%
Office/ Medical	3%
Institutional/Municipal	3%
Entertainment, Recreational and Cultural	3%
Industrial	1%-3%

Table 3: Recommended Minimum EV Parking Spaces

Another building code issue is accessibility. Table 4 recommends a minimum number of accessible EVSE using a ratio of 1:50 based on the Federal Access Board's ADA Accessibility Guidelines (Access Board, 2002).

Number of EV Charging Spaces	Min. Number of ADA EV-Charging Stations
1-50	1
51-100	2
101-150	3
151-200	4
201-250	5
251-300	6

Table 4: Recommended Minimum Accessible Charging Stations

We do not recommend that accessible charging stations be signed or reserved for exclusive use by persons with disabilities at this time. Additional information on ADA compliance can be found in a separate REVi-sponsored report found at <http://www.vacleancities.org/wp-content/uploads/EV-Charging-ADA-Version-1.0s.pdf>.

Building Permit Processing

Residential, including single residences and multi-unit developments, and commercial EVSE permitting standards are regulated by the Virginia Uniform Statewide Building Code (VUSBC). Few building code or building permit encumbrances exist in the Richmond Region that affect EVSE installation. REVi recommends that local governments adopt any of the following actions not already implemented:

- Make available EVSE installation brochures at the local permitting and/or planning offices that reference relevant code.
- Provide an EVSE permitting procedures checklist (see Appendix 1).
- Use an online EVSE permitting process.
- Streamline inspection procedures.
- Record the address, voltage and amperage of the EVSE that will be installed.
- Notify the electric utility about the location and type of EVSE when the permit is issued.
- Fast-track EVSE installation projects.

Accomplishing these objectives will assist local governments in supporting a coordinated approach to EV infrastructure deployment in the Greater Richmond Region.

Ordinance and Development Guidelines

This section offers guidance on installing EVSE and pertains to safety, convenience, and protecting community values. It should be considered when amending building codes and used to create public information materials in support of improving EV charging station installations.

Design of EVSE:

- EVSE charging cables should have a retraction device or other means to safely manage the cables during storage and while in use.

Placement of EVSE:

- Access to charging equipment controls and cables should be no more than 48 inches from ground elevation and no lower than 24 inches.

Obstructions:

- Placement of EVSE should not diminish normal use of the adjacent street and sidewalk.
- Charging infrastructure placed within sidewalks should not interfere with ADA-accessibility guidelines such as clearance widths and other accessible route considerations.

Signage:

- Directional and way-finding signs should be installed at parking access and decision points that effectively guide motorists to EV charging stations.
- Signage identifying EV charging stations should indicate that the space is only to be utilized for EVs or EV charging.
- For on-street parking, each charging space should be posted with EV signage indicating the space is only for EV charging purposes, and should include time limits and tow away penalties, if applicable.

Minimum lighting:

- Lighting is recommended at all charging stations, unless only daytime charging is permitted. Minimum lighting is defined as providing a minimum illumination of two foot-candles extending from the charger to the EV charging point/port. Lighting should conform to current jurisdictional lighting ordinance requirements (i.e. light spill cut-off angles & dark sky).

EVSE Information:

- Information at the EVSE should contain all necessary safety information, time limits, fee information, and contact information for reporting equipment malfunctions or other problems.

Flood Plain:

- EVSE should be placed above base flood elevations.

Accessibility:

- At parking facilities where accessible parking is required, ensure that accessible EV charging is also provided. This includes parking space and access aisle widths, maximum allowable slope, and turnaround space for wheelchair operation (Mayfield, 2012).
- Utilize existing ADA-accessible access aisles and other accessibility features to the extent feasible.

- Parking for accessible EV charging should be located as close as possible to the parking facility's intended destination.

Convenience:

- Place EVSE where it can be easily reached yet protected from vehicles.
- Add a striped access aisle next to the EV parking space where it is appropriate to increase access to the EVSE and ease use of the charging cable.

EVSE Protection:

- Place EVSE in a protected location or provide wheel stops or bollards as needed to protect equipment.

Safety:

- EV charging stations planned for surface parking that will be used after dark should be sited in high-visibility locations to enhance personal safety.
- Ensure that placement of EVSE, bollards, wheel stops, signage, and other features do not create a tripping hazard or other type of safety concern. Place such that cables in use do not cross sidewalks or other pedestrian pathways.
- Selection of on-street EV spaces should be reviewed for operational safety by a traffic engineer.

Electric Charging Station Layout Recommendations

The following drawings show sample Level 1 and Level 2 EV charging station layouts for off-street surface parking, on-street parking, and enclosed parking in a structure (see Figures 11, 12, 13, and 14). Additional layouts can be found at <http://www.vacleancities.org/wp-content/uploads/Site-Design-for-EV-Charging-Stations-1.0.pdf>.

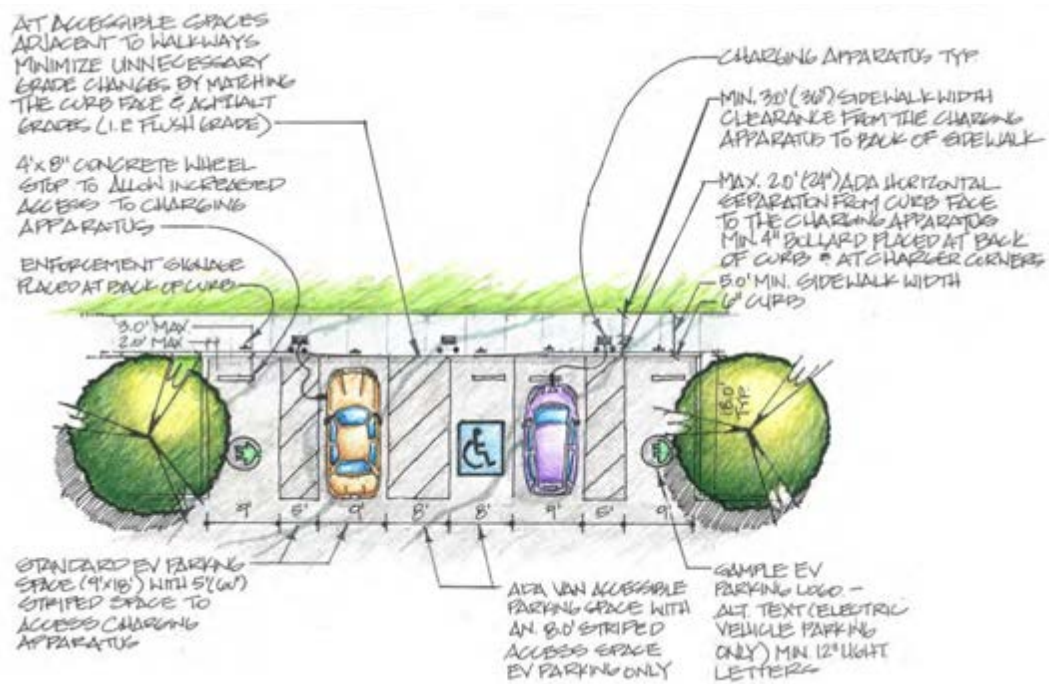


Figure 11: Example of 90-Degree EV Parking Adjacent to Sidewalk

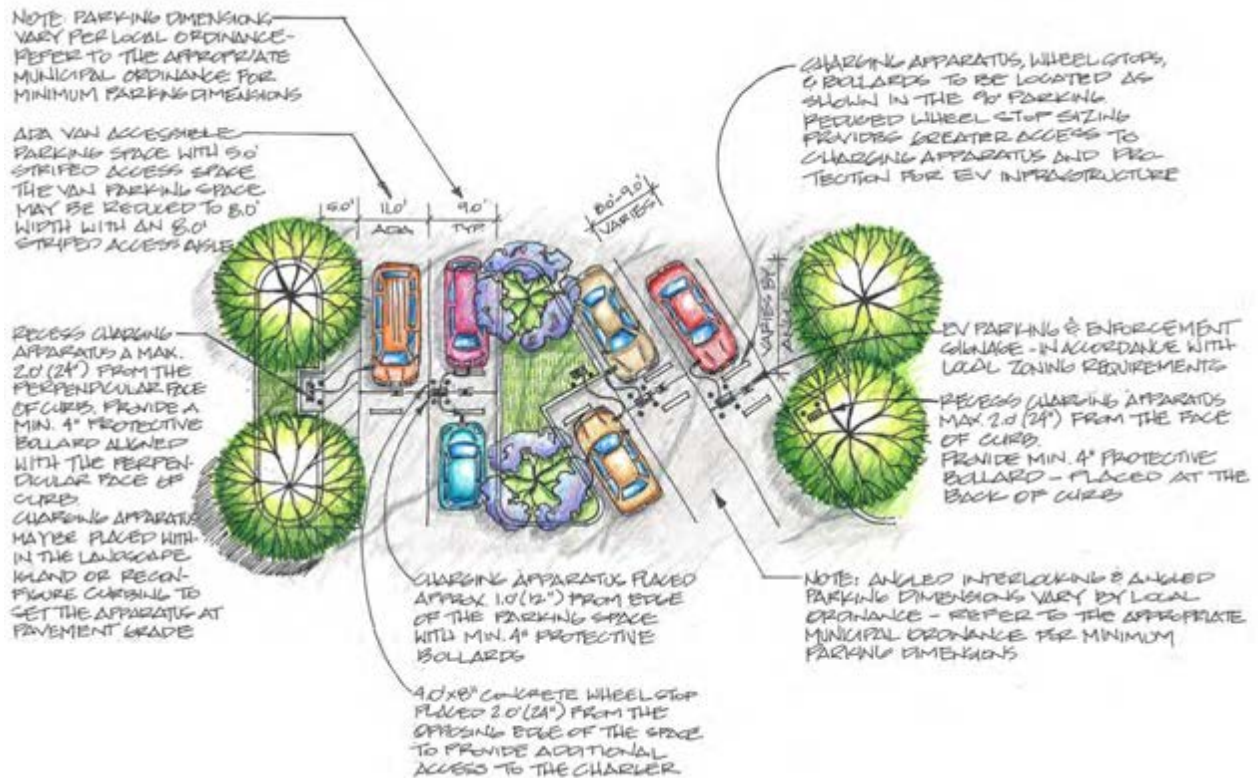


Figure 12: Adapting Parking Spaces within a Parking Lot

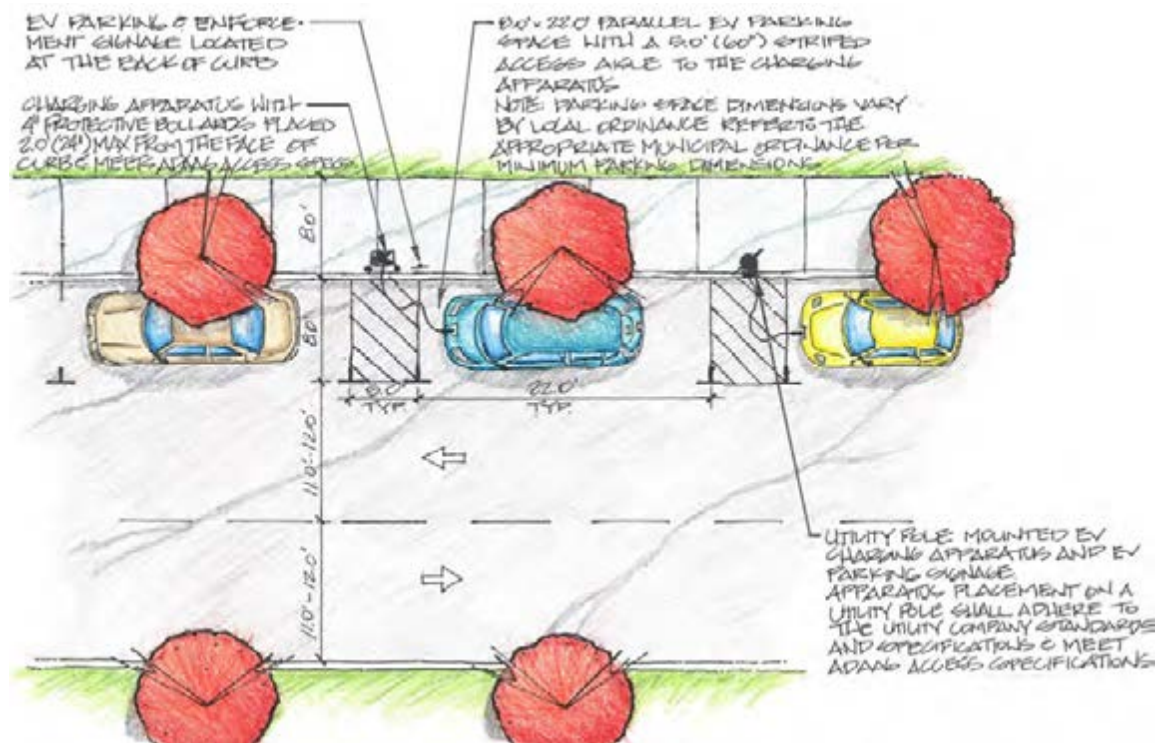


Figure 13: Example Layout for On-Street Parallel Parking

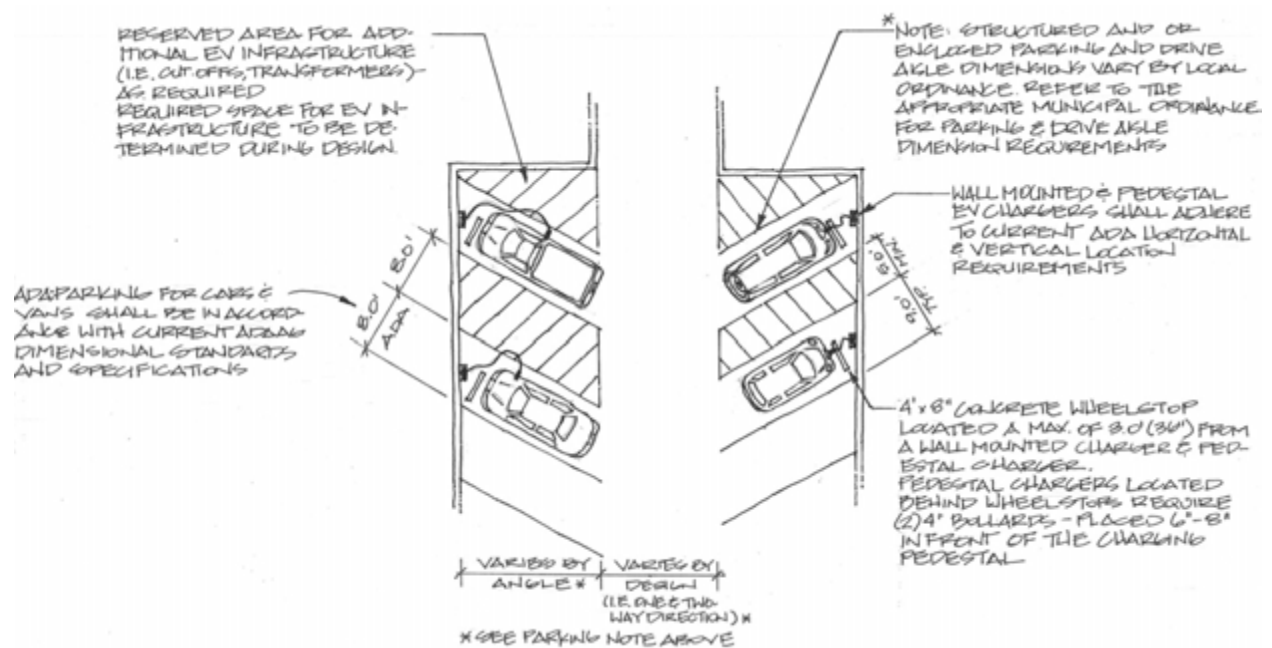


Figure 14: EV Charging Stations in Parking Structures

Signage Guidelines and Recommendations

Signage is needed for a range of EV-related applications. For example, way-finding signs should guide EV drivers to charging locations off of federal or state highways and other signs should designate parking spaces reserved for EV charging. Although parking signage requirements differ between federal, state, and private jurisdictional applications, it is important to have consistency at least within each jurisdiction. The following guidelines are intended to serve as recommendations for various types of EV-related signage.

General Service Signs

General Service Signs are approved for use in VDOT maintained rights-of-way (Virginia Department of Transportation, 2011). Signs shown in Figure 15 are consistent with federal standards.

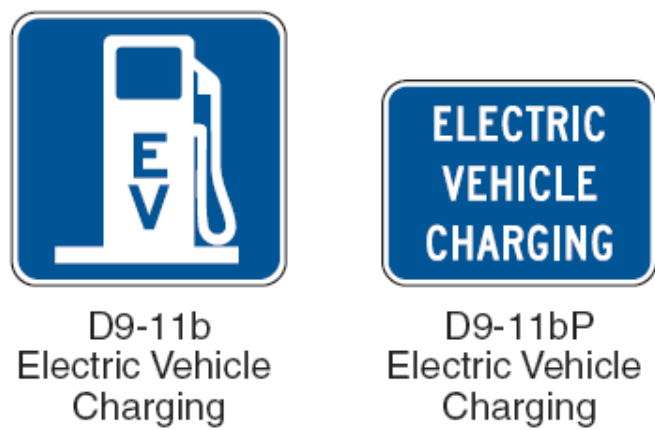


Figure 15: VDOT-Approved EV Charging Signs

Sign or Plaque	Sign Designation	Section	Conventional Road	Freeway or Expressway
Electric Vehicle Charging	D9-11b	21.02	24" x 24"	30" x 30"
Electric Vehicle Charging (Plaque)	D911-11bp	21.02	24" x 18"	30" x 24"

Table 5: VDOT-Approved EV Charging Sign Specifications

VDOT-approved directional signage is shown in Figure 16 below.



Figure 16: VDOT-Approved Directional Signage

Additional Regulatory Signs and Plaque Sizes

Consistent signage is important to help find charging stations and also to understand associated parking regulations within each jurisdiction. During the course of the REVi, project staff proposed sign content and designs for utilization by local jurisdictions and property owners. Signs shown in Figure 17 would inform the public about parking restrictions associated with EV charging (also see Table 6).



Figure 17: EV Informational and Regulatory Signage

Sign	Sign Designation	Section	Minimum	Oversized	Color Federal Standard 595C
No Parking Except Electric Vehicles	R7-21b	2B.46	18" x 12"	21" x 15"	34230, 27038, 27780
No Parking Except Electric Vehicles Charging	R7-21c	2B.46	18" x 12"	21" x 15"	34230, 27038, 27780
Reserved Parking Electric Vehicles	R7-8b	2B.46	18" x 12"	21" x 15"	34230, 27780
Number of Hour Charging	R7-108a	2B.56	18" x 12"	21" x 15"	34230, 27780

Table 6: Details of Informational and Regulatory Signage

Signs shown in Figure 18 would help drivers locate charging stations, identify the charging station parking, and also indicate the level of charging available (also see Table 7). At this time, none of these designs have been approved by VDOT. REVi recommends that these or similar signs be adopted by local jurisdictions throughout the region once agreement on design has been reached with VDOT.



Figure 18: Recommended Directional Signage for Use outside VDOT-Controlled Right-of-Way

Sign	Sign Designation	Conventional Road	Minimum	Oversized	Color Federal Standard 595C
Electric Vehicles Charging Station	EV-ST-1	24" x 18"	18" x 12"	21"x 15"	34230, 27780
Electric Vehicles Charging Station	EV-ST-2	24" x 18"	18" x 12"	21"x 15"	34230, 27780
Electric Vehicles Charging Station Directional	EV-ST-3	24" x 18"	18" x 12"	21"x 15"	34230, 27780
Electric Vehicles Charging Station Directional	EV-ST-4	24" x 18"	18" x 12"	21"x 15"	34230, 27780
Electric Vehicles Charging Station Information	EV-ST-5	24" x 18"	18" x 12"	21"x 15"	34230, 27780

Table 7: Details of Directional and Charging Station Signage

Current Status of Codes and Permitting Activities

Successful deployment of EVSE within the Richmond Region is being facilitated by developing a uniform approach to EV infrastructure in both the public and private sectors. In an effort to develop a regional consensus, the REVi Codes, Permitting and Site Installation team completed the following action items:

- Conducted a case study/planning analysis to project primary and secondary growth areas for EV adoption and infrastructure deployment.
- Obtained general letters of support for REVi's Strategic plan from the nine participating regional planning departments in the Richmond Region that will use the plan as a resource to guide EV infrastructure development and deployment. REVi also obtained a resolution from the Town of Ashland Town Council supporting the REVi strategic plan.
- Prepared and distributed multiple EV charging infrastructure documents, including:
 - o EV Zoning and Development Guidelines.
 - o Regional EV Sign Package.
 - o EV Infrastructure Siting and Installation Checklist.
- Coordinated with Richmond Area Metropolitan Planning Organization (RAMPO) for inclusion of EVs and the associated infrastructure in the long-range transportation plan (Plan 2035 LRTP) and review in future RAMPO plans and programs.

Localities throughout Virginia and the nation can advance similar efforts using the initial templates provided by this plan.

Policies and Incentives

Introduction

Legislative, regulatory, and other public policy forums provide the opportunity to reduce or eliminate barriers that may be hindering adoption of EVs and the associated infrastructure. Similarly, policy may also be crafted to encourage EV adoption through financial or non-financial incentives. EVs and EVSE are emerging as beneficial technologies, and as such the REVi team encourages the refinement of existing law and regulations to help facilitate their adoption.

The sections below provide analysis and recommendations regarding a number of federal, state, and local policies and incentives.

Federal Government

Plug-in Vehicle Tax Credit

Currently, qualified EVs are eligible for a tax credit of up to \$7,500 based on battery size and gross vehicle weight. This tax credit has been instrumental in catalyzing a nascent EV market that is significantly impacted by the higher retail prices associated with most EVs. The President's Fiscal Year 2013 Budget Proposal proposed increasing the tax credit to \$10,000. While REVi welcomes continued support of this incentive, we encourage the conversion of the tax credit to a rebate that would reduce the upfront purchase price for the consumer. Consumers or dealers must still finance the full manufacturer suggested retail price, and then claim their tax credit when they file income tax returns. A rebate that reduces the upfront purchase price may open the EV market to consumers who cannot obtain sufficient financing. Furthermore, a rebate would allow organizations without income tax liability to benefit from the vehicle incentive. Finally, consumers, fleets, and dealers should continue to be educated on this tax credit as awareness is limited.

Alternative Fueling Infrastructure Tax Credit

Prior to January 1, 2012, tax credits of up to \$1,000 for residential consumers and \$30,000 for non-residential consumers were available for alternative fueling infrastructure, including electricity. Congress recently reinstated this credit and made it applicable to infrastructure installed prior to December 31, 2013. REVi enthusiastically supports the extension of the infrastructure tax credit, and believes it will be important in facilitating the widespread deployment of EVSE.

Federal Highway Rights of Way

Chapter 23 of the United States Code of Federal Regulations (CFR) prohibits any entity from charging the public for goods and services at rest areas except for telephone access and articles dispensed by vending machines. Furthermore, vending machines are prohibited from dispensing petroleum products or motor vehicle parts.

These restrictions prevent anyone from providing EV charging services for a fee within Federal right-of-way. For example, Dominion Virginia Power installed charging stations at the Interstate-64 Westbound Rest Area in New Kent County, Virginia. The electricity is provided to the public free of charge, with VDOT responsible for the electricity bill.

VDOT identified this particular regulation as a potential barrier to deployment of EVSE along highway corridors. Highway rest areas are most well suited for faster Level 2 AC or DC Fast Charging EVSE, which may require significant capital investment. The inability to charge fees for their service would serve as a disincentive to EVSE providers. We recommend that Federal Highway Administration and US Department of Transportation adopt regulations that provide an exemption in Chapter 23 of the CFR enabling public and private EVSE providers to charge for their service.

State Government

Background

Legislation was passed during the 2011 Virginia General Assembly session clarifying the eligibility of non-utilities to provide EV charging services. Virginia law currently prohibits non-utilities from selling electricity at retail unless the non-utility suppliers meet specific requirements. The 2011 legislation, House Bill 2105, deems non-utility EV charging service providers to not be engaged in the retail sale of electricity provided that the electricity is sold only for transportation purposes and is purchased from the incumbent electric utility. The bill also states that the provision of EV charging services is a permitted utility activity and that non-utility EV charging service providers are exempt from regulation as a public utility. Finally, this legislation, which became law on July 1, 2011, allowed utilities to evaluate options to develop and offer special rates to encourage off-peak charging. House Bill 2105 helped enable Dominion Virginia Power's EV Pilot Program.

Emissions Inspections

Motor vehicles are currently exempted from Virginia state emissions inspections if they are powered exclusively by clean fuels, including electricity. Virginia law provides an exemption for qualified hybrid motor vehicles if they attain a United States Environmental Protection Agency (EPA) rating of at least 50 miles per gallon during city fuel economy tests. Legislation was recently passed by the Virginia General Assembly reducing that number to 48 miles per gallon for certain vehicles.

REVi appreciates the recognition from the Virginia General Assembly that highly efficient hybrid vehicles should be exempt from emissions inspections. However, the current and proposed exemption is restricted to vehicles that meet a 48 mile per gallon city fuel efficiency rating from the EPA. While PHEVs meet the Virginia definition of "hybrid motor vehicle," the EPA calculates its city fuel efficiency rating based only on the gasoline engine. It does not factor in the efficiency of the electric fuel. Although the Toyota Prius Plug-in Hybrid still achieves a city fuel efficiency rating of greater than 50 miles per gallon based solely on gasoline, other PHEVs like the Chevy Volt and Ford C-Max Energi remain below this threshold.

The EPA's combined rating, known as miles per gallon equivalent (MPGe), evaluates the efficiency of both electricity and gasoline. PHEVs like the Volt and C-Max Energi are rated at 94 MPGe or higher, and should be recognized for their high fuel efficiency. Data submitted to the EPA currently shows that PHEV owners are achieving actual average fuel efficiencies well in excess of 50 miles per gallon, making them more fuel efficient

than HEVs. We recommend that Virginia law be amended in the 2014 General Assembly session so PHEVs with a combined MPGe rating of 90 or higher are exempted from emissions inspections. This exemption will save PHEV drivers time and expense on these inspections.

HOV Lane Exemptions

Legislation passed in 2011 exempted clean special fuel vehicles, which include vehicles fueled by electricity and hybrids, from meeting occupancy requirements of Virginia's High Occupancy Vehicle (HOV) lanes through June 30, 2012. Legislation was passed in the 2012 General Assembly session that extends the sunset date in perpetuity. However, the 2012 legislation also requires the Commissioner of Highways to submit an annual report detailing traffic volumes that could result in a degraded condition on Virginia's HOV lanes. This report is used to determine future restrictions on the eligibility of clean special fuel vehicles to be exempted from occupancy requirements of Virginia's HOV lanes.

While the extension of the HOV lane exemption for clean special fuel vehicles is helpful, the HOV lane exemption along the Interstate 95/395 corridor in Northern Virginia is only available to clean special fuel vehicles registered on or before July 1, 2006. Similarly, the HOV lane exemption along the Interstate 66 corridor in Northern Virginia is only available to clean special fuel vehicles registered on or before July 1, 2011. No EVs registered after July 1, 2011 can benefit from this exemption.

While REVi recognizes the need to reduce congestion on the Commonwealth's HOV lanes, EVs should be granted an exemption from all HOV lane occupancy requirements. With approximately 1,000 EVs registered in the Commonwealth, there is no imminent threat of overcrowding Northern Virginia's HOV lanes. REVi discussed this concept with VDOT during an August 2012 meeting, and ultimately concluded that a legislative change would be required to exempt EVs from all HOV lane occupancy requirements. We recommend Virginia law be changed in the 2014 General Assembly session to address this issue.

Electrical Inspection Jurisdiction

In an effort to address the challenges associated with deploying EVSE in areas with no off-street parking, Dominion Virginia Power identified a possible solution involving the use of existing utility poles. They are investigating the possibility of leasing space on utility poles to third-parties interested in installing EVSE along streets where there is limited off-street parking. Part of the research included reaching out to several localities in an effort to identify any potential permitting or zoning barriers. Although most localities did not anticipate any unusual problems, there was some confusion regarding jurisdiction over electrical inspections for EVSE installed in the public right-of-way.

Most electrical inspections for homes and businesses are managed by the local building or permitting department. Electric utilities will typically not energize an electrical service until they receive notification from the locality of a successful electrical inspection. Although consistency from locality to locality is important, the larger concern is the issue of liability. A utility that leases space on their poles to EVSE providers may be held liable if the non-utility-owned electrical wiring damages equipment or injures a member of the public. Traditional practices requiring municipal inspections reduce the burden of liability on the utility for non-utility-owned wiring. However, if non-utility-owned EVSE in the public right-of-way are not subject to municipal inspections, the burden of liability rests more squarely on the utility, which may serve as a disincentive to similar utility initiatives designed to provide charging infrastructure in the public right-of-way.

We recommend the Virginia Statewide Uniform Building Code be clarified to require that municipal electrical inspectors inspect all non-utility-owned EVSE installations in the public right-of-way, including those on utility poles.

Virginia Transportation Funding

Legislation was passed in the 2013 Virginia General Assembly session that revises how transportation funding is collected and distributed. Key components of the proposal include the elimination of the current 17.5 cents per gallon motor fuels tax on gasoline that will be replaced with a 3.5 percent wholesale tax on gasoline and 0.3 percent increase to the Sales and Use Tax. The legislation also will impose a \$64 annual fee on alternative fuel vehicles, which include PHEVs and BEVs.

The bill ultimately passed in a form that taxes hybrid vehicles (including PHEVs) at rates significantly higher than ICE vehicles. While REVi recognizes the importance of vehicle owners contributing their fair share to transportation funding, we recommend that the \$64 annual fee be adjusted to reflect that hybrids, including PHEVs, still use gasoline and should not be assessed the same annual fee as a vehicle that completely avoids the use of gasoline. Virginia's government leaders should be educated on benefits of EVs and PHEVs prior to the next legislative session, with the hopes of adjusting the transportation funding mechanism to one that taxes consumers based on their usage of the roads as opposed to fuel type.

Local Government

Regional Funds for EV Infrastructure

The Richmond Area Metropolitan Planning Organization (RAMPO) is the federally designated metropolitan transportation planning organization that serves as the forum for cooperative transportation decision making in the Richmond area. It includes approximately two-thirds of the Richmond Regional Planning District, which serves as the contracting agent and administrative and technical staff for RAMPO. Its transportation planning process serves as a forum for local governments, transportation and planning agencies, and VDOT to prioritize regional transportation projects that may be eligible for state and federal funds.

Using this report as a starting point, we recommend submitting a proposal to RAMPO for funding to install publicly accessible EVSE in key locations around the Richmond Metropolitan Area. Primarily, we recommend focusing on areas identified by our analysis as those most likely to support EV adoption. REVi partners plan to submit the proposal to RAMPO by fall of 2013.

Parking Enforcement

Parking enforcement of spaces designated for EV charging has emerged as one of the more frustrating challenges in the early deployment of EVSE in Virginia. EV owners attempting to charge at publicly available locations have been stymied by ICE vehicles that are parked in spaces clearly designated for EV charging. This became a particular problem at a county-owned park-and-ride facility in Northern Virginia, so county officials asked the local sheriff's department to begin ticketing ICE vehicles that were parked in spaces reserved for EV charging. However, the sheriff's office was unable to fulfill that request because county ordinances did not authorize them to enforce these parking regulations.

REVi researched parking regulations in counties, cities, and towns in an effort to devise a solution to this problem. The Code of Virginia, in §46.2-1220, prescribes that the governing body of any locality may regulate parking, stopping, and standing of vehicles within its limits. Furthermore, it authorizes the localities to make and enforce regulations including, but not limited to, penalties for violations.

«§ 46.2-1220. Parking, stopping, and standing regulations in counties, cities, or towns; parking meters; presumption as to violation of ordinances; penalty.

The governing body of any county, city, or town may by ordinance provide for the regulation of parking, stopping, and standing of vehicles within its limits, including the installation and maintenance of parking meters. The ordinance may require the deposit of a coin of a prescribed denomination, determine the length of time a vehicle may be parked, and designate a department, official, or employee of the local government to administer the provisions of the ordinance. The ordinance may delegate to that department, official, or employee the authority to make and enforce any additional regulations concerning parking that may be required, including, but not limited to, penalties for violations, deadlines for the payment of fines, and late payment penalties for fines not paid when due. In a city having a population of at least 100,000, the ordinance may also provide that a summons or parking ticket for the violation of the ordinance or regulations may be issued by law-enforcement officers, other uniformed city employees, or by uniformed personnel serving under contract with the city. Notwithstanding the foregoing provisions of this section, the governing bodies of Augusta, Bath, and Rockingham Counties may by ordinance provide for the regulation of parking, stopping, and standing of vehicles within their limits, but no such ordinance shall authorize or provide for the installation and maintenance of parking meters.

REVi recommends that Richmond regional communities update their codes to allow enforcement of EV Only parking places, similar to the example provided by the City of Raleigh as provided below:

“Sec. 11-2174 of the Raleigh City Code is hereby amended by adding a new subsection (c) thereto to read as follows:

(c) The city council may designate certain parking spaces on city streets at or near electric charging stations for use only by electric vehicles. An electric vehicle is one that operates, either partially or exclusively, on electrical energy from the grid, or an off grid source, that is stored on board for motive purpose. An electric charging station is equipment that has as its primary purpose the transfer of electric energy to a battery or other energy storage device on an electric vehicle.

Spaces designated as reserved for electric vehicles shall be clearly marked as such. When a space has been so marked, no person shall park or stand any nonelectric vehicle in that space. If an electric vehicle is parked in such a designated space but is not attached to the charging station it is in violation of this ordinance. Any nonelectric vehicle so parked is subject to civil fine or removal. The fine for violation of this ordinance is fifty dollars (\$50.00) and shall be collected in the same manner and with the same penalties for late payment as other on street parking violations. Any vehicle parked in such a space must make the appropriate payment for the space and observe the time limit for the underlying parking zone.”

Personal Property Tax

Most motor vehicles in Virginia are subject to personal property tax rates levied by local governments. The Code of Virginia §58.1-3506 classifies a number of items of property, including vehicles fueled solely by electricity, separately from other classifications of personal property. Local governments may levy a tax on these separately classified items of property at a different rate not to exceed that applicable to the general class of tangible personal property. Essentially, this allows local governments to assess a reduced property tax rate on vehicles fueled solely by electricity.

While REVi recognizes that the financial challenges confronting the public sector may make a reduction in property tax rates for EVs difficult to support, this information was shared with local government representatives to ensure they were aware of their options. We recommend local governments consider using this reduction in assessing personal property taxes on EV owners. We further recommend that §58.1-3506 be amended to include the eligibility of PHEVs for separate personal property tax rates.

Conclusion

Significant EV adoption will likely require amendments to existing policy and creation of new policy to address the unique challenges presented by the vehicles and charging infrastructure. Several recommendations for policy and regulatory change have been offered in this section including:

- Supporting tax credits that advance EV and infrastructure purchases and deployment.
- Encouraging adoption of regulations that enable public and private EVSE providers to charge for their service.
- Supporting HOV exemptions for EVs.
- Supporting regional funding of publicly accessible EVSE in key locations around the Richmond Region.
- Including the cost of EVSE materials and installation in vehicle financing arrangements from vendors.

While financial incentives are important, such as the Federal plug-in vehicle tax credit, they should not be the sole focus of policy and incentive agendas designed to encourage EV adoption. Both public and private sector organizations are challenged by current economic realities, so the feasibility of financial incentives is limited. Rather, there should be significant effort devoted to supporting non-financial policies and incentives that reduce, eliminate, or counteract barriers posed by education, cost, and access.

Pilot Programs and Other Opportunities

Time-of-Use Rate Pilot Program

Dominion Virginia Power (DVP), the regulated investor-owned electric utility that provides electric service to the majority of the Richmond Region, applied to the Virginia State Corporation Commission (SCC) for approval of its EV Pilot Program on January 31, 2011. The application was approved with an effective date of October 3, 2011. This program allows two time-of-use rates for residential EV charging. Both rate options are designed to encourage off-peak charging in an effort to avoid adding load at current peak times and/or overloading local distribution circuits. One rate option, Schedule EV, is for EV-charging only and requires a separate meter. A customer can recharge his or her EV for as little as 54 cents per night for a 40-mile commute. The second rate option, Schedule 1EV, is a whole-house rate that relies on a single meter to measure all electricity usage associated with the entire house. A customer can recharge his or her EV for as little as 51 cents per night for a 40-mile commute.

The main purpose of the EV Pilot Program is to collect valuable energy usage and customer charging behavior data, which is helping DVP to analyze potential grid impacts from EV charging, as well as the effectiveness of price signals at influencing charging behavior. The data will assist in the development of DVP's Integrated Resource Plan which is a document that forecasts growth in customers' demand and energy over the next fifteen years. The Plan identifies the most cost-effective way to meet that growth with existing and potential resources.

Participation in the pilot program, combined with information collected from vehicle manufacturers, the DMV, and the enhanced electric permitting process, will provide valuable information including EV charging load shapes, customer charging patterns and behaviors, and most importantly, the extent to which price signals can adequately induce customers to shift charging to off-peak periods. All of these inputs, in aggregate, will help Dominion Virginia Power analyze potential grid impacts. The extent to which the EV Pilot Program time-of-use rates result in customers' shifting charging to non-peak hours will help determine whether Dominion Virginia Power will seek to make those rates permanent as part of the portfolio of energy efficiency and peak shaving programs that Dominion Virginia Power offers or whether other measures are needed to shape customer charging patterns.

DVP must file annual reports to the SCC regarding the progress of the EV Pilot Program. These reports should be publicly available on the SCC website. At the time of this writing, this document can be located also at the State Corporation Commission website <http://docket.scc.virginia.gov/vaproduct/main.asp> by searching for case number PUE-2011-00014.

Workplace Charging Pilot Program

DVP recently began a pilot workplace charging program for employees at its corporate headquarters in Richmond. Participating employees pay a flat monthly fee through an authorized payroll deduction in exchange for access to parking spaces designated for EV charging. The monthly fee is designed to recover the electricity and infrastructure costs. Designated parking spaces are equipped with lockable 120-volt receptacles using dedicated branch circuits. When employees are not charging, they are required to lock the receptacle covers to prevent unauthorized use.

DVP elected to install 120-volt receptacles because most employees leave their cars in the garage for eight to ten hours a day while working. Installation costs for multiple receptacles were considerably less than those for Level 2 EVSE. If successful, DVP hopes to expand the availability of workplace charging to more offices using this pilot as a template. Additionally, DVP wants this pilot to serve as an example that Level 1 EVSE are an effective option for employers that wish to provide access to workplace charging without making huge capital investments.

EVSE and Vehicle Leasing/Financing

For those consumers interested in Level 2 EVSE, installation costs can easily reach several thousand dollars based on the layout and wiring of their charging location. This additional cost could be seen by first time owners as a barrier to adoption. As a potential solution, REVi supports including the cost of EVSE materials and installation in vehicle financing arrangements from vendors. Based on discussions with various representatives from the automotive industry, this option is already available in some instances. Nevertheless, REVi recommends that original equipment manufacturers, auto dealers, and lenders that do not currently offer this option consider doing so in an effort to facilitate adoption of EVs without making huge upfront financial investments.

Potential Pilot with Renewable Energy

Pairing pilot deployment scale renewable energy with EV charging at James Madison University has been proposed. In 2012, the Virginia electricity generation portfolio consisted of primarily non-renewable fossil fuels. If renewable sources of electricity were used to charge EVs, more environmental benefits would result.

According to the Virginia Center for Wind Energy, James Madison University has access to 7.5 kilowatts of wind energy and 10.75 kilowatts of solar energy with the potential for charging electric vehicles. Between these two sources, there is power available for charging EVs. This demonstration could show that modest investments in renewable power can refuel electric vehicles.

Promoting Workplace Charging

Although current data shows that most charging occurs at home, EVSE availability outside of the home will become increasingly more important, particularly for consumers who do not have access to garages or other forms of off-street parking. In an effort to encourage employers and retail businesses to install EV charging stations, REVi provides the following considerations relating to the development of workplace charging programs.

Level of Charge

Many potential EV consumers spend eight or more hours per day at their place of employment. Outside of the home, this presents the next most logical opportunity for EVs to charge. Long periods of inactivity are ideal for EV charging. Conveniently, EVs that are idle for eight or more hours at the workplace do not require Level 2 (240V) EVSE. A dedicated 15-amp, 120 Volt ground fault circuit interrupter branch circuit and outlet is more than adequate for the vast majority of workplace charging. Level 1 charging, as described above, is a much less expensive solution that may allow an employer to install several receptacles for the price of one Level 2 EVSE.

An employer may want to consider making one or two Level 2 EVSE available for employees that need to travel during the day and thus require a faster charge than is available with Level 1 charging. Level 2 EVSE will almost always cost more than the Level 1 infrastructure, but it may be important to provide employees with a faster charging option if needed.

Cost of Charging and Payment Collection

Each employer must decide whether to require its employees to pay for access to workplace charging. Some employers may decide to provide workplace charging for free. If so, they need to carefully consider any tax implications, as well as the degree to which workplace charging could be considered an employment benefit if charging is unrelated to job requirements. Furthermore, employers should be cognizant of potential concerns from employees who own ICE vehicles yet do not receive free gasoline. Ultimately, employers must carefully weigh the costs and benefits of subsidizing, even partially, access to workplace charging.

Employers who elect to assess a fee for workplace charging must decide how much to charge and how to collect the payment. Typically, workplace charging costs will consist of equipment and installation, electricity, and occasional maintenance. Employers who install Level 2 EVSE have the opportunity to use networks and other payment functionalities offered by EV service providers.

However, employers may install Level 1 outlets as a cheaper and easier solution than Level 2 EVSE. In order to collect payment, employers may choose to assess a fixed monthly fee for unlimited charging designed to recover infrastructure and electricity costs. Alternatively, they could identify a small fixed monthly fee, and then bill the employee monthly based on actual electricity consumption. Actual payment could be accomplished through payroll deduction. These examples are two of many different ways to assess and collect payment for access to workplace charging facilities.

Controlled Access

The inherent nature of workplace charging makes it unlikely that employers will allow the public to use EVSE installed for employees. Consequently, employers should consider whether they will need to restrict access to the EVSE, and if so, to what extent. For example, an employer who already has a secure gated facility may not need to take additional measures if workplace charging is provided free to employees. However, an open lot or facility may warrant some type of access control. Similarly, if an employer requires their employees to pay for workplace charging, then access must be restricted solely to paying employees.

Several current Level 2 EVSE models use a subscription network that authorizes charging based on a monthly subscription or via point-of-sale credit card payments. Finally, some Level 2 EVSE models may be installed with a keypad built into the system that allows only those employees with the access codes to initiate charging events.

Charging Rotation

There may be instances where demand for workplace charging outpaces the capability and/or willingness of the employer to provide EVSE. In these cases, employers might consider rotating vehicles in and out of charging spaces. This will likely be more relevant with Level 2 EVSE because they require shorter charging times. For example, a Level 2 EVSE may be able to fully recharge a vehicle in three to four hours assuming a commute of 40 miles, which suggests that the EVSE will be available for at least two EV owners during the course of an average workday. An employer wishing to install Level 2 EVSE will most likely have to devise a plan to rotate vehicles so the EVSE will be used throughout the work day.

Level 1 EVSE are typically most effective in situations where the vehicle will remain unused for several consecutive hours. As such, the need for charging rotation is considerably less. The additional Level 1 charge points reduce the need for charging rotation, and vehicles can remain parked and charging for the entire day.

Human Resources Considerations

As mentioned earlier, providing free charging for employees may constitute taxable income, and employers should be cognizant of this implication in their decision making. Additionally, if extensive charging is provided for free, it may constitute an employee benefit if unrelated to employee job requirements, which could present tax implications for the employer and employee. Finally, employers with union-represented employees should refer to the union contract to determine if any obstacles exist with regard to union-represented employees.

In summary, prior to deploying a workplace EV charging program, employers should consult with their human resources department and/or legal labor and employment representation.

Liability Concerns

Any employer who wishes to proceed with a workplace EV charging program should consult with legal counsel concerning their potential liability if an employee is injured while charging or if an equipment malfunction damages the employee's vehicle. Such an event may also trigger workers' compensation laws depending on the specific scenarios as they relate to state law. Some liability issues may be addressed in a contract between the employer and the employee, as permitted by state law. Employers should also verify if their general liability (or other) insurance policy will cover employee EV charging of personal vehicles. This may be accomplished by consulting with internal risk management or claims professionals, but should also include a specific request to the insurance company to determine if workplace EV charging is protected under the specific policy.

Promoting Charging for Multi-unit Housing

Providing EV charging stations at multi-unit housing can be complicated. Few parking places at existing multi-unit dwellings have available circuits and most that do are limited to 120-volt service. Furthermore, parking for EVs in multi-unit housing often cannot be sited near the driver's electrical meter. Bringing adequate electrical service to the parking could require installing a new transformer and electrical panel. This affects both installation costs and fair payment for the power. Parking in multi-unit housing comes either bundled (cost included in with the dwelling) or unbundled. Some condominiums attach a specific parking place to the condominium owner's deed.

Non-resident owners may have few incentives to justify potentially expensive installations. Property managers and residents may lack the authority to approve equipment installations. The following actions are recommended to encourage the installation of EV charging stations to serve multi-unit housing:

- As a building permit requirement for new parking facilities, require that a percentage of the parking spaces include EV charging stations or conduit for future EV charging stations. The percentages would vary according to land use type as previously detailed in the REVi report.
- Utilize educational materials to assist both property owners and residents in understanding the legal barriers and solutions to installing charging stations and fairly assigning costs.
- If parking can be reassigned, locate the EV parking in clusters where installation is least expensive.
- Prioritize 120-volt service to assigned parking where cost of installation is relatively low.
- Place Level 2 charging stations at unassigned parking that will be shared. A number of sharing models will develop including networks to attribute costs and schedule appointments.
- For shared EV charging stations, use an EV service provider that charges hourly rates while the vehicle is plugged in. This will encourage moving the vehicle after charging and allowing another EV user to park and charge.
- Consider pairing a car sharing program with EV charging stations.
- Install Level 2 charging stations where the cable can reach more than one parking place.
- Run a new service from the electrical utility nearest parking and install EVSE with the capability of tracking costs for each user.
- Consider off-site locations in the neighborhood for EV charging such as churches, public schools, parks, and neighborhood retail centers.
- Apartment owners could add the convenience of EV charging as part of the service package (along with fitness centers and laundry facilities) associated with the property. Also, property owners could utilize an EV service provider to handle scheduling of patrons and payments for charging.

Education and Outreach

Introduction

Since EVs are an emerging transportation technology, many people simply are uninformed regarding their positive attributes. From training programs for automotive technicians and first responders, to a comprehensive outreach program designed to educate the general public on the benefits of EVs, educating the public is a critical component of any EV deployment plan. Through effective outreach, barriers including cost, performance and accessibility can be addressed. Education, training, outreach and communications were all used to inform and dispel misinformation about EV technology.

Training

An education and training program, including the marketing of technician-oriented classes related to EVs, is essential to a plan for EV deployment in the region. J. Sargeant Reynolds Community College's Hybrid and Electric Vehicle Technology Certificate is an example of such a program. This certificate is designed to train automotive dealership employees, independent automotive technicians, safety inspectors, service and parts personnel and service writers regarding EVs.

In addition to training individuals in the automotive industry, it is important to educate first responders, EVSE installers and the general public.

Technical Training for Our Future Automotive Technicians

J. Sargeant Reynolds Community College (JSRCC) is committed to aiding the Richmond community with the deployment of EVs. The College understands the changes occurring in the automotive industry and how they impact the community at-large.

In 2009 the US Department of Energy awarded a grant to the College to develop an advanced electric drive vehicle program. To prepare the region's automotive workforce to work with EVs, JSRCC developed a training program which offers students an array of automotive technology courses and certificates, including an Associates of Applied Science degree in Automotive Technology. An added benefit of the target marketing of this program to student audiences (approximately twenty thousand students) is the creation of EV awareness in the community at-large.

Program Description:

JSRCC's Career Studies Certificate is an accredited award or certification achieved from an abbreviated program consisting of fewer course hours than degree programs (Associate of Applied Sciences, for example). It provides an opportunity for upgrading occupational or technical skills, retraining for career change, and investigating new career possibilities.

The objective of the Hybrid and Electric Vehicle Technology Certificate is to train the automotive workforce in the Richmond Region on EV technology. Potential students include automotive dealership and independent shop technicians, safety inspectors, service and parts personnel and service writers.

The program is offered as an on-campus lecture and laboratory series. Plans are also underway to make the lecture element available to students online. The online option gives JSRCC the opportunity to expand its educational reach to other parts of the Commonwealth.

The curriculum requirements include the following courses:

- Introduction to Alternative Fueled & Hybrid Vehicles
- Control Electronics
- Electric Vehicles
- Plug-in Hybrid Electric Vehicles
- Hydrogen Fuel Cell Electric Vehicles

Target Student Audience:

The Hybrid and Electric Vehicle Technology certificate benefits any automotive technician or service representative working with the general public or corporate or public fleet programs including the following groups:

- Automotive Technology Associate of Applied Science alumni or currently enrolled students of JSRCC or other colleges
- Employers and government agencies with vehicle fleet management program
- Automotive dealer and independent shops
- National service enterprises (for example: Avis Car, Sears, and Firestone Tire)

REVi helped the college promote this program through its standard marketing efforts. These efforts included a brochure (Figure 19), mailings to current students and alumni, mass market media announcements, website banner announcements, intra-campus promotions in the campus newsletters and closed-circuit TV, and outreach to the greater Richmond high schools and trade centers.

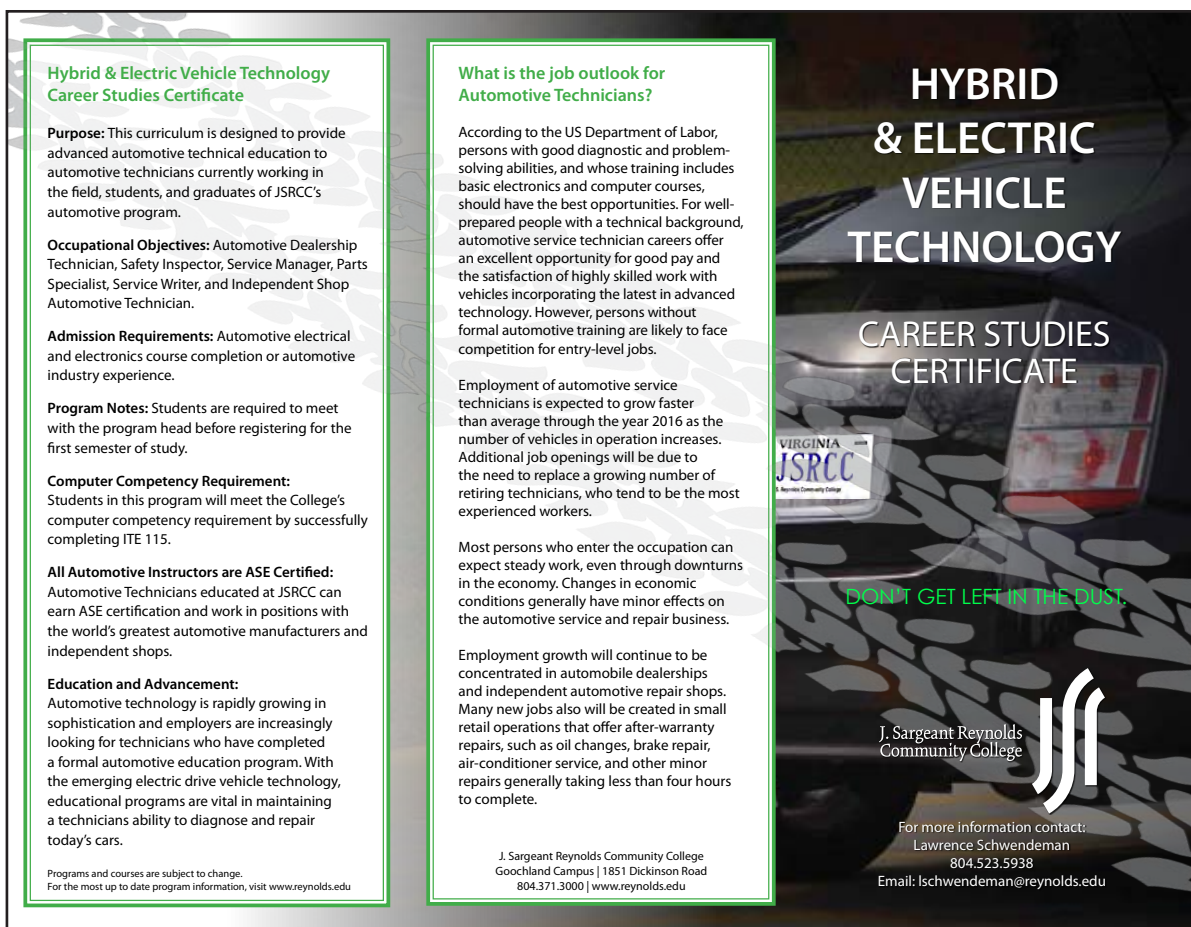


Figure 19: Brochure Used to Market Course

EV Education and Training for the Greater Community

Workplace Charging Training:

The REVi team reached out to local businesses to assist in the education of their employees on the positive attributes of owning an EV and using EV charging stations. REVi also assisted businesses in the development of EV charging station installation plans and workplace charging programs.

For example, REVi and JSRCC partnered with Capital One for a personal development training seminar on EVs for corporate employees. Recently, the company installed a number of charging stations in new parking garages at their corporate campus in the Richmond Region and initiated a workplace charging program. The session included a demonstration on how to charge an EV at one of the company's new charging stations, an overview of EV benefits and the opportunity to test drive an EV.

Personal Development Training:

Based on REVi input, JSRCC created a 2 hour seminar to educate college employees and the general public about EVs. This seminar was first presented to college employees in March of 2013 and was attended by 30 individuals. Another seminar is scheduled for April of 2013. The same seminar will be presented to residents of Goochland County on a community day to be scheduled. This seminar is available to any community organization that wishes to help its members learn more about this new automotive technology.

First Responder Training:

JSRCC and the Virginia Department of Fire Programs worked together develop a prototype class for first responder training in 2012. Using the fire training curriculum developed by the National Alternative Fuels Training Consortium, the College conducted an eight-hour course and lab for two groups of first responders: the Town of Colonial Heights Fire and Rescue and Caroline County Fire and Rescue.

Subsequently, the state contracted with the National Fire Protection Association to use their on-line training program for first responder basic training. The state's fire program works with local fire and emergency education programs to assure personnel understand how to work with an EV in dangerous situations such as vehicular accidents. The College has also added EVs into a course on fire behavior and combustion through the Fire Science Program.

Jumpstarting EV Awareness: Outreach and Communications

The 2010 US Census reported that the typical Richmond Region driver uses a single occupant vehicle and has one of the lowest average commute times in the state. These two indicators have led many to believe that the region can benefit from the use of EV technology. However, public perception of EVs and consistent misinformation related to cost, accessibility and performance have provided a significant barrier for EV deployment in the region.

A professional and targeted outreach and communications program is critical in an attempt to dispel misinformation and provide a healthy environment for EV deployment.

REVi's initial phase of outreach concentrated on sharing the positive aspects of EVs with the Richmond Region's businesses, governments and citizens through both a top-down and bottom-up approach focusing on grassroots efforts and media exposure. REVi identified the following key components of an EV outreach strategy:

- Grassroots remote outreach through phone calls, e-mail marketing, internet, social media
- Earned media placements in order to spread the positive aspects of EVs to the general public to create a ripple effect
- Events focused on educating key influencers in the community as well as the general public

Grassroots Outreach

Grassroots outreach provides an opportunity to create a growing advocacy network for EVs and can result in a ripple effect as each person tells another person and that person tells someone else. The following is a sampling of REVi grassroots outreach activities the project implemented and suggests as part of an EV deployment plan that can be repeated elsewhere.

Starting an EV Car Club

Local EV Clubs are good grassroots networks for electric vehicle owners and enthusiasts. REVi repeatedly partnered with the nascent Richmond Electric Vehicle Club to support their events and programs and to acquire demonstration vehicles. REVi partners hosted the club for meetings at JSRCC and assisted the club with brainstorming ideas to increase membership. REVi also presented its plan, while JSRCC provided an overview of its EV technology courses.

Internet Outreach

When conducting an outreach campaign, it is important to provide a portal where interested individuals and organizations can find information. The REVi project established VirginiaEV.org to service this purpose and regularly used this website as a portal for posting EV news in the region.

E-mail marketing serves as an effective means for sharing news and information about upcoming EV events. REVi built a substantial Constant Contact e-mail list of nearly 500 individuals with a direct interest in EVs in the region.

Social Media and Digital Advocates

In 2012 *Outside Magazine* held a contest on Facebook to see which “river city” its readers thought was the coolest place to live. Based upon the number of Facebook “likes,” Richmond won by a landslide. The Richmond community is recognized nationally as one of the most connected groups in the country when it comes to social media outlets such as LinkedIn, Facebook, Twitter, YouTube, Tumblr and others.

A social media network can provide value in reaching a targeted audience with an interest in responding to, or sharing EV messages. The REVi social media network has three components: building the Richmond Electric Vehicle profile, attracting members to connect or join, and maintaining an on-going dialogue with members of the social group about relevant content.

REVi was successful at building the Richmond Electric Vehicle profile on LinkedIn, Twitter and Facebook.

- REVi created a LinkedIn group called Richmond Electric Vehicle Group and invited area stakeholders to join. LinkedIn served as an effective means of sharing EV news and REVi event announcements with the business community.
- REVi utilized the Virginia Clean Cities Facebook page (see Figure 20) to promote REVi activities, EV news and promotions for EVs in the region. REVi made sure to “like” various EV stakeholders including dealerships, manufacturers and interested environmental groups. This resulted in many of these groups opting to “like” the Virginia Clean Cities Facebook in return and stay up-to-date on EV news and REVi happenings.



Figure 20: Virginia Clean Cities Facebook Page

- REVi utilized the Virginia Clean Cities Twitter account to share content, event information, and networking messages with interested stakeholders across the region as well as media. Similar to the REVi Facebook strategy, REVi “followed” various stakeholders and media and tweeted them to ensure that they would become more engaged in the EV dialogue on the Virginia Clean Cities Twitter (see Figure 21). REVi was very successful at tweeting partner organizations and utilizing hash tags, resulting in a high retweet level and opening REVi’s EV messages to a much larger and varied audience.



Figure 21: Example Tweet

Attracting additional members to connect and join in on social media platforms can also be accomplished by offering incentives. In the Outside Magazine Facebook contest mentioned previously, when members voted, they were given a chance to win a trip. On-line promotions could help build EV connections in Richmond and in many cases beyond the Richmond geographic area. Give-always relevant to the EV owner experience could be especially effective in increasing participation on social media platforms.

Maintaining an on-going dialogue requires social media advocates to produce or re-post content which is conversational in nature and incites others to join. This content must be relevant for Richmond EV owners and interested parties.

Phone Campaigns

In order to gauge interest and build advocates for EV and EVSE adoption as well as extend invitations to our Business Case for Electric Vehicle Charging Stations Forum, the project directed phone calls to targeted high-impact groups. These groups included the region's top 50 employers, local governments, trade associations, shopping centers and hotels. REVi used these calls as an opportunity to provide EV education and gauge which groups have an interest in purchasing an EV or charging station and which groups would like to learn more. REVi then conducted follow-up phone calls and provided additional information as needed. For example, the Westin Hotel informed REVi that they included charging stations in their sustainability plan. These phone calls, in addition to other outreach modes, resulted in nearly 100 attendees at REVi's Business Case for Electric Vehicle Charging Stations Forum.

Earned Media Campaign

Earned media, favorable publicity garnered through promotional efforts other than paid advertising, is an effective way to spread the positive aspects of EVs to the general public and create an outreach ripple effect throughout the region. Earned media placements have been a cornerstone of REVi's outreach success, and REVi has incorporated media outreach into a variety of events and activities.

For general events, REVi drafted a media advisory in order to alert the media to the significance of the event and provide an event overview (see Figure 22). In some cases, REVi designed events specifically in order to generate news and facilitate media coverage. An example of one such event was the First Official Plug-in at the First Hotel Charging Station in Richmond with Mayor Dwight Jones. This event was extremely successful in generating print, radio, television, on-line and social media coverage about the vehicles and infrastructure.

In addition to events, REVi discovered that the EV story is an "evergreen" business story in the Richmond Region. Virginia Clean Cities currently maintains a working relationship with media outlets throughout the region, and this relationship was leveraged to promote on-going discussions about the technology, the vehicles and charging infrastructure and public policy. "Evergreen stories" regarding EVs provide an opportunity to give a status update on the state of EVs in the region and current technology advancements and benefits. One such media placement garnered by REVi was a business video interview with the *Richmond Times-Dispatch* (Virginia's statewide newspaper of record). The interview took the form of telling the story about what businesses should consider when deciding between a hybrid and an EV.



Figure 22: Example Media Clip

See Appendix 4 for additional media clip examples.

Events

In order to generate buzz about EVs in the Richmond Region and engage interested organizations, key influencers, media and members of the general public, targeted events can be a powerful outreach tool. Throughout the course of the REVi project, a number of large events garnered attention and spread REVi messages across the region.

The purpose of these informational gatherings was to familiarize the audiences on the economic and environmental advantages of using EV technologies and to gather feedback on community impact.

Activities performed:

- Hosting stakeholder workshops on infrastructure requirements
- Creating and promoting public access information (movies/videos) on EVs
- Teaming with local automobile dealers on new vehicle launches
- Assisting businesses with employee education on EV benefits and charging station use
- Educating Richmond businesses on the economic and environmental benefits of installing charging stations for their customers

The following are examples of some of the events conducted:

REVi Kick-off Meeting:

This meeting was held for Advisory Board and Working Group members as well as individuals from REVi's many partner organizations. It served as a general organizational meeting for the project and succeeded in building initial momentum among partner organizations for project activities.

Richmond Electric Vehicle Workshop:

In the early months of the project, REVi held a workshop at the Virginia Housing Center including a presentation on ECOTality's EV Project infrastructure study and a general EV technology overview. With approximately 50

individuals attending, this event was successful at continuing to build enthusiasm among partner organizations, government leaders and the public at-large.

Richmond Electric Vehicle Rally and Screening of “Revenge of the Electric Car:”

In partnership with JSRCC, Sierra Club and the Sustainable Transportation Initiative of Richmond, REVi hosted a screening of the documentary *Revenge of the Electric Car* in order to generate positive buzz about EVs in the region and dispel misinformation. Local automobile dealers offered test-drives to attendees. The event resulted in press coverage in the *Richmond Times-Dispatch* (statewide newspaper) and on National Public Radio. This event served to launch REVi’s efforts in providing information to the general public. The media coverage exposed EV technology to the entire Richmond Region.

Local EV Launch and Promotion:

REVi teamed up with Ford Motor Company, Richmond Ford, Richmond International Raceway, and NASCAR to launch Ford Motor Company’s first all-electric car, the Focus Electric (see Figure 23). Adding to the local news value, the Focus Electric went on sale in Richmond as one of the first markets across the country. REVi assisted with promoting a press conference to make the announcement with Bill Bolling, Lieutenant Governor of Virginia. In addition, REVi assisted with promoting a Focus Electric ride & drive event for the general public at Richmond Ford. Finally, using a grassroots approach, REVi promoted the benefits of using an all-electric vehicle the day of the race by passing out informational EV materials to attendees. The Focus Electric was featured as the first all-electric pace car for a NASCAR race, and the sequence of events around the Focus Electric resulted in significant positive regional and national media exposure for EVs.



Figure 23: Focus Electric at Richmond International Raceway

Strategic Meeting and Conference Presentations

REVi found it useful to deliver targeted presentations on EV technology and deployment plans at key meetings in the Richmond area as well as throughout the country. The following are examples of events at which REVi presented:

- 2012 Association for Commuter Transportation Conference in Savannah, Georgia
- Plug-In 2012 Conference in San Antonio, Texas
- City of Richmond Department of Economic Development meeting
- Metropolitan Planning Organization Board Meeting
- Virginia Commonwealth University: Urban Planning Guest Lecture
- City of Richmond Planning meeting
- Virginia Commonwealth University Energy and Sustainability Conference: Alternative Fuel Panel
- Virginia Department of Mines, Minerals & Energy: Energy Division Staff Meeting
- Meetings of planning departments from localities across the region
- Sustainable Transportation Initiative of Richmond Meeting
- North Carolina PEV Readiness meeting
- Retail Merchants Association meeting
- Washington, DC EV Taskforce meeting

Student Outreach

The REVi team presented the documentary *Revenge of the Electric Car* to automotive students at Hanover Center for Trades and Technology. Following the screening, REVi answered questions and prompted discussion on the benefits of EVs. Outreach initiatives such as this are valuable in reaching the next generation of EV owners and industry employees.

REVi partnered with Virginia Tech's EcoCAR team on their outreach effort, including events and demonstrations with their student engineered electric vehicle. In addition, REVi included the team on planning efforts and provided exposure through VirginiaEV.org.

Business Case for EV Charging Stations

An important aspect of increasing the demand for EV use is for business owners to understand the economics of installing EV charging stations for their customers and employees.

Virginia Clean Cities and their REVi partners, including the Richmond Omni Hotel, hosted an informational presentation on EV charging stations for the Richmond business community. The program featured a presentation from National Electrical Manufacturers Association and several charging station manufacturers. The highlight of the presentations was the testimony of local businesses that are using charging stations to satisfy a customer need, generate revenue, and offer an employee benefit.

REVi incorporated a news element into the event by inviting City of Richmond Mayor Dwight Jones to perform the first official plug-in of the first charging station at a Richmond hotel (see Figure 24). The event garnered significant media coverage including TV, radio, print, on-line and social media for EV technology and its benefits.

The Omni Hotel's Business Case for Electric Vehicle Charging Stations Case Study can be found in Appendix 3.



Figure 24: First Official EV Plug-in with Mayor Dwight Jones

Tax Credit Workshop

Through the REVi project, Virginia Clean Cities partnered with the Virginia Society of Certified Public Accountants for a workshop providing an overview of how tax credits and incentives for alternative fuel vehicles (including EVs specifically) work. The workshop included presentations on alternative fuels with a focus on EV technology, followed by a tax credits and incentives presentation by a tax expert and CPA. Attendees then had the opportunity to ask questions. A reporter from National Public Radio also attended the event and conducted interviews with REVi partners and the tax expert.

Networking

REVi attended many local networking events. These gatherings provided a venue to educate the Richmond Region's business and community leaders on EV and EVSE.

A sampling of networking events is shown in Table 8:

Organization or Event	Educational Impact
Urban Land Institute of Richmond	Involved land planning for Richmond Region. Members include municipal planners, business owners and home contractors.
Press Conference: Plugless Power	Virginia based EV power manufacturer announces a plugless power charger. Attended by state officials (including the governor) and business owners.
Leadership Metro Richmond	Presented REVi message to leadership organization.
Greater Richmond Chamber of Commerce, Hanover Business Council	Networked with local businesses.
Richmond Earth Day Festival	Attended and distributed EV technology material on behalf of City of Richmond Sustainability Program.
Local Chevy Dealers' Networking Event	Represented REVi's message on EVs.
Virginia Chamber of Commerce	Presented to Environment Committee on REVi policy issues.
Richmond Retail Merchants	Represented REVi's message on EVs and charging stations during their Recycle Day campaign.

Table 8: Sample Networking Events

Marketing Materials

Marketing materials and content are necessary to inform the general public of the benefits and costs savings one enjoys while using the new technology. In a fun and informal manner, the myths and misunderstandings of an EV can be communicated to Richmond consumers and business owners. The message must show Richmond in a leadership role, setting an example for other towns and cities throughout the region and the Commonwealth to follow.

The marketing materials include video, handouts and giveaways.

Video

A video with local consumer interviews can quickly address barriers associated with EVs. By showing members of the local community interacting with EVs and EVSE in their everyday life, a powerful message can be sent to the public. Videos can be made available for distribution through all public service channels and virtual channels such as YouTube and other social media outlets. REVi has secured interviews with consumers and is currently in the process of producing a video to tell the local EV story and address barriers.

Informational Handouts

Handouts provide a tangible way to educate the public about the myths and misunderstandings surrounding EVs. Handouts must incorporate relevant data including evidence to address the various EV barriers. The pamphlets should be available for distribution during various events and meetings.

Types of informational handouts and their target audience are shown in Table 9 below:

Target Audience	Topic
Consumer	Myths of Purchasing and Owning an EV
	Benefits and Economics of Owning an EV
Retailer	Business Case of Installing Charging Stations for Customers
Employer	Workplace Charging Opportunity for Employees
Property and/or Fleet Managers	Site Selection for EV charging: Comprehensive Vehicle Information for Fleet Managers

Table 9: Types of Informational Handouts

REVi created content and made use of handouts from the Department of Energy and Virginia Clean Cities to address barriers associated with EVs. See Appendix 4 for examples of handouts.

Give-away Products

For community events and business and social meetings, tangible products of nominal value should be available to promote EV technology awareness. The types of products include, but are not limited to, bumper stickers, antenna balls, auto shades, key chains, and pens.

Summary of Education and Outreach

Public perception of EVs and misinformation related to cost and accessibility create significant barriers for EV deployment in the Richmond Region and across the Commonwealth. Therefore, this project required a comprehensive outreach and communications program. Continued efforts for communication and outreach are recommended because this technology continues to rapidly evolve and much of the population still operates with misinformation.

Conclusion



Electric vehicle deployment in Virginia will assist statewide efforts to reduce vehicle emissions, increase energy independence, and generate positive economic development for the Commonwealth. This Richmond Electric Vehicle Initiative (REVi) Plan for Plug-in Electric Vehicles and Charging Infrastructure is a critical milestone in moving the Commonwealth one step closer to an oil-free future.

REVi partners have already initiated activities in many areas such as public outreach and education, policy development, and pilot programs that are advancing deployment. As this Clean Cities-sponsored project concludes, our stakeholder coalition is ready to move forward using the information developed and to promote action on the key recommendations described in the plan's Executive Summary. It is REVi's hope that these recommendations become a framework that benefits localities across the Commonwealth while they enact their own unique plug-in electric vehicle and infrastructure planning.

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Advanced Vehicle Research Center
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Hubbell
J. Sargeant Reynolds Community College
James River Air Conditioning

Policy and Incentives Working Group

ECOtality
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Virginia Department of Housing and Community Development
Virginia Sierra Club
Volkswagen

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Virginia Commonwealth University
Virginia Department of Environmental Quality
Virginia Department of Transportation
Virginia Department of Motor Vehicles
Virginia Economic Development Partnership
Virginia Society of Certified Public Accountants
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The following template is provided as an example of an EVSE permitting and installation checklist that local governments can make available in their permitting and planning offices. Once a publicly acceptable vehicle charger is installed, the location, details, and contact information should be submitted to local or state Clean Cities Coordinator (Virginia Clean Cities) for public map.

Richmond Electric Vehicle Initiative Readiness Plan | i

Site Selection Checklist



Electric Vehicle Supply Equipment (EVSE) site selection is important to an efficient and effective electric vehicle transportation infrastructure.

Use this checklist to identify good EVSE site locations:

- ☐ Will the site be available for public access?
- ☐ Is the site in a high trafficked or attended area?
- ☐ Is the site spread out from other charging stations?
- ☐ Will the site be highly visible?
- ☐ Will the site be an area where people plan to spend at least a 1/2 hour?
- ☐ Will the site be capable of network connectivity through a cell signal or WIFI?
- ☐ Is the site safe for public access? (i.e. away from moving traffic and other hazards and well lit if nighttime charging is anticipated)

Useful tips and info

Good charger density and visibility can aid in reduction of range anxiety and extend public awareness of electric vehicles. Through careful planning, we can anticipate future needs and place groundwork to expand as EV base matures.

Installation cost will vary greatly depending on the proximity to a power source, so efforts should be made to balance cheap parking spaces with visible parking spaces. Parking lots are ideal locations, especially ones that are high capacity and have high traffic during all times of the day and night.

To increase public awareness and visibility, consider including educational displays at the site. City-vehicle or visible special fleet only locations can promote the message as well.

Public Map of EVSE in Virginia:
<http://www.afdc.energy.gov/afdc/locator/stations/>

Please register EVSE online at http://www.afdc.energy.gov/afdc/progs/station_form.php
or submit by phone to 540-568-8896 or by email aharned@hrccc.org

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July 2011

Appendix 3. Case Study: Business Case for EV Charging Stations



Business Case for Electric Vehicle Charging Stations Omni Richmond Hotel - Richmond, VA

The Omni Richmond Hotel has installed the first charging station at a hotel in Richmond. The \$2,000 charging station installed at the Omni Hotel has already paid for itself in revenue generated by new guests. They have selected the hotel based on access to an electric vehicle charging station during their stay.

In addition to generating revenue, the Omni Richmond Hotel views the charging station as a way to generate community exposure and reduce the hotel's environmental impact. The first official plug-in and Business Case for Electric Vehicle Charging Stations Forum event, hosted by Virginia Clean Cities at the hotel generated a statewide "buzz" about the positive impact associated with installing an electric vehicle charging station.

New business impact

- Ten new reservations made in first two months specifically because of the electric vehicle charging station
- Competitive advantage over other Richmond hotels
- Many reservation requests inquire about hotel's green efforts
- Virginia state government has a goal to utilize green hotels
- Strong statement on commitment to the environment

Exposure within community

- Guests and prospective associates notice the charging station
- The charging station has gotten media attention including radio, TV, print and social media

Environmental impact

- Zero tailpipe emissions for commuters and guests through cleaner electric vehicles



Get in Touch

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Appendix 4. REVi Earned Media Examples

Newspaper Articles (Print)

Jones cheers opening of new car-charging station

Richmond Times-Dispatch – October 17, 2012

Jones cheers opening of new car-charging station

Richmond mayor, group tout benefits of green ventures

BY ROBERT ZULLO
Richmond Times-Dispatch

Mayor Dwight C. Jones helped officially open the first electric car charging station at the Richmond Omni on Wednesday following an event at the hotel that made the case for installing the stations as a sound business decision.

Organized by Virginia Clean Cities, a nonprofit partnership between government and industry that promotes alternative fuel vehicles and infrastructure, the forum, called the "Business Case for Electric Vehicle Charging Stations," ended with Jones plugging in an electric Ford Focus in the hotel's garage.

Richmond, with about nine charging stations across the area, is among the launch markets for the all-electric Focus, and the city also received a \$460,000 federal grant that has funded the Richmond Electric Vehicle Initiative, a planning and education study organized by the city, state and Dominion Virginia Power to promote electric vehicles, said Alleyne Harned, Virginia Clean Cities' executive director.

"Electric vehicles and infrastructure represent an opportunity for individuals and businesses to advance energy, economic and environmental security through reducing petroleum," Harned said in a news release.

Harned said the charger cost the hotel about \$2,000 and has since paid for itself in guests that seek the hotel out because of the opportunity to charge their cars.

"It turns out to have been a great business decision," he said.

In a statement, Jones said the effort to increase the availability of charging stations fits with goals of the city's RVAgreen sustainability plan, including lower greenhouse gas emissions.

"The RVAgreen Plan supports electric vehicles and charging stations because they provide options that are more economically competitive and environmentally resilient than traditional vehicles," Jones said.

rzullo@timesdispatch.com
(804) 649-6998

Newspaper Online Video Interview

Richmond Times-Dispatch – August 13, 2012

Metro Business asked Michael Phillips, project manager for Virginia Clean Cities, about what businesses should consider when deciding between a hybrid and electric vehicle.

Full interview: <http://www2.timesdispatch.com/business/2012/aug/13/tdmbiz16-60-seconds-with-michael-phillips-ar-2126380/>

60 Seconds with: Michael Phillips

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Michael Phillips
Project manager for Virginia Clean Cities

60 Seconds with... Michael Phillips

RICHMOND, Va. — Metro Business asked Michael Phillips, project manager for Virginia Clean Cities, about what businesses should consider when deciding between a hybrid or electric vehicle.

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Public gets chance to test electric cars

Richmond Times-Dispatch – April 17, 2012

Public gets chance to test electric cars

Hunter Benes, a Chevrolet Volt owner, tried out a Nissan Leaf on Monday during the Richmond electric vehicle rally, a kickoff event for the Richmond Electric Vehicle Initiative project. The event at J. Sargent Reynolds Community College's Parham Road campus included more than half a dozen electric vehicles and drew 30 to 40 people. The event also featured a screening of the 2011 documentary "Revenge of the Electric Car," which chronicles the story of the renewed interest in electric car development. The U.S. Department of Energy has awarded a planning grant to Virginia Clean Cities and the state Department of Mines, Minerals and Energy for the \$430,000 Richmond Electric Vehicle Initiative to help make the region a market for electric vehicle technology. More than 50 organizations have joined in the effort.

Richmond electric vehicle rally See what happens when the public is invited to drive electric cars. At TimesDispatch.com/search/gallery

All-electric Ford to set RIR pace

From staff and wire reports

Ford Motor Co. will become the first manufacturer in NASCAR history to supply an all-electric car as the pace car.

The new Focus Electric will lead the field at the April 28 Sprint Cup Series race at Richmond International Raceway.

Ford research shows the majority of Americans would consider buying an electrified vehicle but do not yet understand the different technologies," Mark Fields, president of Ford's Americas division, said Monday.

"Highlighting the Focus Electric as a pace car is a fun way to educate consumers about the kinds of benefits our electrified vehicles deliver and show people our commitment to provide Ford customers the power of choice for leading fuel economy in the vehicle that best meets their needs."

The car will be unveiled to the public at the Virginia Capitol on April 25.

Ford also was the first to use a hybrid vehicle as pace car when the Fusion Hybrid led the field at Homestead in 2008. Ford in January unveiled its Fusion as its 2013 car to be used in NASCAR competition.

Joint Program Press Release

City of Richmond – October 16, 2012

Press release for the official plug-in at the first public charging station at a Richmond Hotel with Mayor Dwight Jones, City of Richmond and Virginia Clean Cities.



For Immediate Release
October 16, 2012

Contact: JayEll Vaughn
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Michael Phillips
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mphillips@vacleancities.org

Mayor Jones to Perform Official Plug-in at First Electric Vehicle Charging Station Located at a Richmond Hotel

WHO: Mayor Dwight C. Jones
Michael Phillips, Virginia Clean Cities Project Manager
Christopher Alto, Richmond Omni Hotel Manager

WHAT: Opening of Richmond Omni Hotel's first public charging station

WHEN: **Wednesday, October 17, 2012 at 11:30 a.m.** (Forum begins at 8:45 a.m.)

WHERE: Omni Richmond Hotel
100 South 12th Street
Richmond, VA 23219

Background:

The City of Richmond has been an important partner in the Richmond Electric Vehicle Initiative --- a planning grant for electric vehicles through the Clean Cities Community Readiness and Planning for Plug-In Electric Vehicles and Charging Infrastructure grant.

"This effort fits into Richmond's triple bottom line goals of the City's RVA Green plans of sustainability and will help lower greenhouse gas emissions in the city," comments Mayor Dwight C. Jones.

"Electric vehicles and infrastructure represent an opportunity for individuals and businesses to advance energy, economic, and environmental security through reducing petroleum," said Alleyn Harned, Executive Director of Virginia Clean Cities.

Prior to the official plug-in, Virginia Clean Cities is hosting the *Business Case for Electric Vehicle Charging Stations Forum* at the Omni Hotel. The event will provide an overview of electric vehicles and make the case for installing electric vehicle charging stations. In addition, this is one of the first times in Richmond that the Ford Focus

Electric, Tesla Model S and Fisker Karma electric vehicles will be available for test drives. The forum will begin at 8:45 a.m. in the Magnolia Room on the 1st floor.

To schedule interviews or electric vehicle demonstrations with Virginia Clean Cities, please contact Michael Phillips at (434) 760-4485 or mphillips@vacleancities.org.

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Newspaper Articles (Electronic)

Richmond hotel offers electric-car charging station

Richmond Times-Dispatch – October 18, 2012

Mayor Dwight C. Jones helped officially open the first electric car charging station at the Richmond Omni on Wednesday following an event at the hotel that made the case for installing the stations as a sound business decision. Organized by Virginia Clean Cities, a nonprofit partnership between government and industry that promotes alternative fuel vehicles and infrastructure, the forum, called the “Business Case for Electric Vehicle Charging Stations,” ended with Jones plugging in an electric Ford Focus in the hotel’s garage.

Full Article: http://www.timesdispatch.com/news/richmond-hotel-offers-electric-car-charging-station/article_2928b87a-06ea-535e-95b1-fd40d623125e.html

Now he can charge up his car at VCU

Richmond Times-Dispatch – July 11, 2012

Russell Beyer has the electric vehicle and the will to use it for his Richmond-area tax business. He just needs more opportunities to charge it while he makes his rounds. “I’ve charged it since I’ve been here,” Beyer said after a news conference Tuesday in the Virginia Commonwealth University parking deck on West Broad Street. The two charging stations in the VCU garage are among an estimated 128 in Virginia, including two more electric vehicle chargers in a staff and faculty garage on the university’s medical campus.

Full Article: <http://www2.timesdispatch.com/news/virginia-news/2012/jul/11/tdmet02-now-he-can-charge-up-his-car-at-vcu-ar-2048020/>

Plug Into Options for Electric Cars

The Virginian-Pilot – June 3, 2012

If you’re considering a new car purchase, an electric car might be worthy of consideration for the first time since the Turkey Trot was a national craze. While the thought of never visiting a gas station again holds appeal, there are things to consider before you take the plunge.

Full Article: <http://www2.timesdispatch.com/business/2012/jun/03/tdmony01-ready-to-plug-in-weigh-the-options-for-el-ar-1961335/>

Electronic Magazine Articles

Virginia Plugs In: Official Plug-In at First Hotel Charging Station in Richmond, VA *Fuels Fix* – Winter 2013

Full Issue: http://issuu.com/jgoverly/docs/fuelsfix_winter2013-final/23



Social Media Coverage – Facebook

Mayor's Office, City of Richmond



Social Media coverage – Twitter



Other Electronic Media

City of Richmond Website



City of Richmond Blog





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