SOUTHEAST REGIONAL EV READINESS WORKBOOK
SECTION 1

U.S. DEPARTMENT OF ENERGY

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Questions? Corrections? Suggestions?

Please send an e-mail EVReadiness@cte.tv with any suggestions for improvements or new case studies for future editions of the Southeast Regional EV Readiness Workbook.

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Introduction

Over the past several years, Americans have increasingly realized the need for an alternative to petroleum-based transportation. Rising and unstable gasoline prices have severely strained our economy and have led to inflationary pressures. Continued turmoil in the Mid-East leaves our oil supply and economy vulnerable. Poor air quality from vehicle emissions causes asthma and lung disease, especially in children and the elderly. Plug-in electric vehicles are an opportunity to address many of these issues. These zero- and low-emission vehicles use low cost, domestically produced energy. However, to have a positive impact on the economy, energy security, and the environment, community stakeholders will need to adopt policies that support awareness, acceptance, and adoption of electric vehicles (EV).

EV Readiness is a collection of strategies, policies, and actions that empower a community to support the deployment of plug-in electric vehicles and charging infrastructure, and, as a result, derive the associated benefits. The purpose of this workbook is to introduce the concept of EV Readiness to community stakeholders in the Southeast—and in particular, in the Tri-State region of Alabama, Georgia, and South Carolina. The workbook provides resources and tools to enable a community to become EV Ready. "EV Readiness" requires the adoption of a number of strategies and policies from a variety of stakeholders to support the deployment of electric vehicles and charging infrastructure.

This workbook is a product of the Southeast Regional EV Readiness Planning Program, one of sixteen *Clean Cities Community Readiness and Planning for Plug-in Electric Vehicles and Charging Infrastructure Readiness* grants from the U.S. Department of Energy. The Southeast Regional EV Readiness Planning Program is a collaborative effort between the following partners:

- Alabama Clean Fuels Coalition
- Center for Transportation and the Environment
- Clean Cities-Atlanta
- Palmetto State Clean Fuels Coalition
- Regional Planning Commission of Greater Birmingham
- South Carolina Institute for Energy Studies at Clemson University
- Southern Company

The U.S. Department of Energy's Alternative Fuel Data Center and the Rocky Mountain Institute's Project Get Ready were valuable resources in the preparation of the workbook and readers are encourage to visit both organizations' web sites for additional information.

Alternative Fuels Data Center: http://www.afdc.energy.gov/
Project Get Ready: http://www.rmi.org/project_get_ready

Readers are also encouraged to engage with their local Clean Cities Coalition. The Clean Cities program is sponsored by the U.S. Department of Energy and supports public and private partnerships to advance the nation's economic, environmental, and energy security by supporting local actions to reduce petroleum consumption in transportation. There are nearly 100 coalitions throughout the United States, including three serving the Tri-State region of Alabama, Georgia, and South Carolina. The coalitions are a valuable resource and are available to help you find answers to any questions you may have regarding your community's EV Readiness.

Websites for each of the Tri-State region's Clean Cities coalitions are as follows:

Alabama Clean Fuels Coalition:	http://www.alabamacleanfuels.org/
Clean Cities Atlanta:	http://www.cleancitiesatlanta.net/
Palmetto State Clean Cities:	http://www.palmettocleanfuels.org/

The workbook is divided into three sections, as follows:

Section I

Section I introduces the concept of EV Readiness, both from a national perspective as well as for communities in the Southeast. It provides an explanation of the roles various stakeholders can play in ensuring a community's EV Readiness, including government, fleets, and property managers/employers as well as utilities, manufacturers, and contractors. Section I introduces the industry and available products as well as current incentives in place to encourage the deployment of electric vehicles and charging infrastructure. Section I also addresses the impact of large-scale deployment of electric vehicles and provides an overview of the Southeast Regional Electric Vehicle Readiness Planning Program.

Section II

Section II includes an in-depth examination of the roles of various stakeholders, including:

- Government
- Fleet Managers
- Property Managers/Employers

Section II includes checklists of various actions each stakeholder group may consider in order to enhance their community's efforts to become EV Ready. It is important to note that not every action is appropriate for every community. Stakeholders may decide to "pick and choose" from the checklist. While every attempt was made to make the checklists exhaustive, there are likely other actions stakeholders can undertake to enable their community to become EV Ready. Sample actions for each of the checklist activities are included as part of Section II.

Section III

Section III provides a number of resources for stakeholders to support their efforts to help their community become EV Ready. This section includes case studies from organizations and communities that have undertaken efforts to support EV Readiness, information to help guide installation of charging infrastructure, and model ordinances to serve as guides for local governments wishing to adopt EV Readiness-supportive measures.

While all efforts were made to be inclusive with the information included in the workbook and identify the most up-to-date information, the EV marketplace is ever changing and advancements are made on a regular basis. You are encouraged to engage with the resources identified in the workbook to stay abreast of the most current information for the industry. In addition, the installation guidelines and model ordinances are included to help educate you on the types of guidance that is available. It is important to note that local and state regulations may vary within the Tri-State region. The information included in this workbook is intended to serve as a guide for your local activities. Any actions undertaken in your local communities will need to be tailored to meet your specific needs and local requirements.

EV Readiness

Nationwide EV Readiness

The electric vehicle market in the United States began to develop in the 1990s, but the market didn't really start to grow until 2010 with the recent advancements in battery storage technologies and the introduction of mass produced vehicles like the Nissan Leaf and the Chevy Volt. It is expected that EVs will have a similar, if not faster, adoption rate as hybrid vehicles due to rising gasoline prices and a variety of Federal and state incentives. Introduced in December 1999 with the Honda Insight and followed by the Toyota Prius in June 2000, hybrid electric vehicles currently have a 3% percent market share in the in the United States[1].

The Federal government is looking to increase the adoption rate of electric vehicles by encouraging the development of charging infrastructure through a series of federally funded programs like the EV Project[2] and the EV Readiness grants. Since 2011, the number of publicly accessible electric vehicle charging stations has increased to provide a greater opportunity for destination charging[3] and reduce range anxiety. As of September 2012, there were more than 4,500 public charging stations installed in the United States. [4]

Cumulative sales of hybrid electric automobiles reached one million units in 2008 and exceeded the 2 million mark in May 2011[5]. In his 2011 State of the Union Address, President Obama proposed a goal of having one million EVs on U.S. roads by 2015. There are approximately 45,000 plug-in electric vehicles on U.S. roads today.[6] Predictions vary on when the U.S. will reach the one million EV mark, but recent, industry forecasts indicate that the U.S. will reach the one million EV mark in 2015[7]. This means that the adoption rate for EVs will be much higher than hybrid electric vehicles.

To achieve these goals and support the mass market adoption of EVs, it is essential that communities become EV Ready by implementing the policies, processes, and incentives that enable EV deployment.

United States Leaders

The Rocky Mountain Institute's Project Get Ready composed a list of cities they believed to be leaders in EV Readiness, and those that were striving to become leaders. They considered key framework elements (barriers, enablers, accelerators), evaluating factors from regulatory requirements, incentives, public charging accessibility, permitting and planning, power reliability, payback, education, consumer behavior, and weather to rank cities into the categories of leader, aggressive follower, fast follower, and follower. [8] Table 1 ranks the top 50 EV Ready metropolitan areas according to the research of Rocky Mountain Institute.

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[1] http://www.hybridcars.com/market-dashboard.html
[2] http://www.theevproject.com/
[3] http://www.afdc.energy.gov/data/tab/all/data_set/10332
[4] http://www.afdc.energy.gov/fuels/electricity_locations.html
[5] http://wardsauto.com/ar/hybrid_sales_million_110607
[6] http://www.csmonitor.com/USA/2012/0705/Plug-in-vehicles-taking-the-slow-road-to-1-million-in-sales
[7] http://grist.org/green-cars/2011-02-08-report-u-s-in-fast-lane-to-put-1-million-electric-cars-on-the/
[8] http://www.rmi.org/Content/Files/Electric%20Vehicles%20in%20America.pdf

Table 1: Top 50 Metropolitan Regions for EV Readiness[9]

Leaders	Cities with a strong foundation for PEVs	Austin Denver Los Angeles New York Orlando	Phoenix Portland Raleigh Riverside Sacramento	San Diego San Francisco San Jose Seattle
Aggressive Follower	Cities with non-traditional foundation for PEVs but high momentum	Detroit Houston Indianapolis		
Fast Follower	Cities with some basis for PEVs, but significant areas of improvement	Atlanta Baltimore Chicago Dallas	Kansas City Las Vegas Minneapolis Providence	San Antonio St. Louis Tampa
Follower	Cities with limited current foundation for PEVs, low planning levels	Birmingham Boston Buffalo Charlotte Cincinnati Cleveland Columbus Hartford	Jacksonville Louisville Memphis Miami Milwaukee Nashville New Orleans Oklahoma City	Norfolk Pittsburgh Philadelphia Richmond Salt Lake City Washington

In addition to assessment efforts undertaken by the Rocky Mountain Institute, automobile manufacturers have also identified EV Ready communities in preparation for staging product launches. In 2011, Ford created a list of the 25 cities within the United States that were most EV Ready[10]. The automaker evaluated cities across the nation using these measures:

- Utility rate structure that encourages "off-peak" or nighttime electric vehicle (EV) charging to minimize demand on the existing electric grid.
- Streamlined permitting and inspection process to support customer and commercial EV infrastructure installation.

[9] http://www.rmi.org/Content/Files/Electric%20Vehicles%20in%20America.pdf
[10] http://green.autoblog.com/2011/04/21/ford-25-most-electric-vehicle-ready-cities/

- Integrated advisory committees that include participation from electric utilities, vehicle manufacturers and dealers, municipalities, EV customers and local coalitions.
- Urban planning approach to optimize public/commercial EV charge locations.
- Infrastructure incentives to offset a portion of customer costs for hardware/installation.

Figure 1: Ford Motor Company's Top 25 EV Ready Cities

A critical success factor in determining EV Readiness is the availability of vehicle charging infrastructure. As of October 2012, the leading states for electric vehicle supply equipment (public and private) are listed in Table 2. As expected, the top five states for EVSE installations correspond to the EV Readiness Leaders listed in Table 1.

Table 2: Leading US States by Number of Installed EVSE

Rank	City	Number of installed EVSE (10/12)
1	California	3,277
2	Texas	1,073
3	Washington	897
4	Florida	799
5	Oregon	696

Xatori, the owners of the PlugShare smart phone application, published a list of the top 10 EV Ready Cities based on the number of charging stations per 100,000 residents (Table 3).

[11] http://www.afdc.energy.gov/fuels/stations_counts.html

Table 3: Leading US Cities by number of Installed EVSE

Rank	City	Number of installed chargers per 100,000 residents
1	Portland, OR	11.0
2	Dallas, TX	10.6
3	Nashville, TN	8.2
4	San Francisco, CA	6.6
5	Seattle, WA	6.5
6	Orlando, FL	6.3
7	Austin, TX	5.3
8	Tucson, AZ	5.3
9	Honolulu, HI	5.1
10	Washington, D.C.	4.7

Southeastern United States EV Readiness

There are only a few Southeastern cities making an appearance on either Ford's list of the top 25 EV Ready cities and the 50 cities on the Project Get Ready assessment. While not current leaders in the electric vehicle movement, Southeastern cities have the potential to become leaders in the EV market. The low cost of electricity, minimal grid impacts, and the combination of Federal and State incentives create an environment highly beneficial for EV deployment.

Cities such as Atlanta, Raleigh, Tampa, and Orlando have become Project Get Ready Cities and are currently engaging in EV Readiness activities.[13] Additionally, the State of Tennessee is involved in the EV Project and rapidly expanding their EV infrastructure. [14]

The Southeastern states with the most charging stations as of July 2012 are listed in Table 4.

Table 4: Leading State in Southeast for Installed EVSE[10]

Rank	City	Number of installed EVSE (10/12)
1	Florida	799
2	Tennessee	644
3	North Carolina	433
4	South Carolina	200
5	Georgia	166

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12 http://www.theepochtimes.com/n2/united-states/the-nations-top-10-electric-vehicle-ready-cities-290920.html
13 http://www.rmi.org/project_get_ready
14 http://www.theevproject.com/overview.php

Southeast EV Readiness

Why the Tri-State Region?

The Tri-State region of Alabama, Georgia, and South Carolina is capable of supporting a high penetration of EVs due to minimal grid impacts, excess electrical generation capacity, low cost of electricity, the favorable incentives available to EV consumers, and the EV Readiness checklists[15] for fleet managers, property managers, employers, and local/state governments developed as part of this workbook. Section II contains checklists of EV Readiness strategies that support the mass adoption of EVs and a comprehensive network of electric vehicle charging stations. Some of the important considerations for the Southeast include:

- The Southeast has some of the lowest electric utility rates in the country. According to the U.S. Energy Information Administration (2011), the average retail price of energy is 9.83 cents per kilowatt-hour across all sectors.[16] The average rates in Alabama, Georgia, and South Carolina are 8.83, 8.81, 8.42 cents, respectively. Historically, electricity prices are far less volatile than gas prices. While Alabama and South Carolina utilities are currently reviewing off-peak pricing strategies, Georgia Power Company (GPC) has adopted an alternative rate structure that includes an off-peak energy rate of 6.01 cents per kilowatt-hour and a super off-peak energy rate of 1.29 cents per kilowatt-hour.[17] These rates are among the best rates for EV charging in the country.

- According to GPC and in conjunction with various studies performed by the Electric Power Research Institute (EPRI), the addition of EVs in the Southeast will have little or no impact to the grid. Furthermore, current electric generation plants have the ability to absorb the energy demands of over 400,000 vehicles before any new generation capacity is required.

- Georgia's incentives are among the best in the country with a state income tax credit, up to $5,000, on the purchase of qualifying vehicles. Businesses in Georgia are also eligible for up to $2,500 in state tax credits for the installation of publically accessible charging equipment. South Carolina offers a state income tax credit equal to 20% of the federal credit, up to $1,500, on the purchase of qualified EVs.

- Alabama, Georgia, and South Carolina have each made significant strides in the planning and implementation of strategies to prepare for the deployment of EVs and EVSE (EV/EVSE). This effort is in coordination with the Clean Cities Coalitions in the Tri-State region. Plug-In Georgia, Plug-In Carolina, and Plug-In Alabama have each been working through EV Readiness and implementation activities in their respective regions since 2011.

[15] See Section II
[16] http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3
[17] http://www.georgiapower.com/pricing/files/rates-and-schedules/2.30_TOU-PEV-2.pdf

Barriers

The Tri-State region has tremendous potential to be a key market for EV's, however there are challenges and barriers to EV/EVSE deployment that must be overcome. For example, the Southeast enjoys low rates for electricity; however, the cost of gasoline is also relatively low compared to other regions of the country. Lower fuel prices can be a barrier to EV adoption when comparing the total cost of ownership of gasoline vehicles to electric vehicles. While electric vehicles have lower operating costs, the initial purchase price is higher than comparable gasoline vehicles. However, with an appropriate mix of policies and incentives to help lower initial purchasing costs, the life cycle cost differential between EVs and gasoline vehicles can be eliminated.

In addition to lower fuel costs in the Southeast, there are four basic barriers to the transition to successful electric vehicle deployment. First, EV original equipment manufacturers (OEMs) have not targeted the Tri-State region for sales nor for pilot programs. The limited availability of vehicles stands as a key barrier to EV deployment in the region. Second, infrastructure availability is somewhat sparse in the Tri-State region. Increasing the availability of publicly available charging stations will help address the concerns of potential consumers about where they can charge their vehicle when away from. Knowing locations exist for charging will help lower consumers' anxiety about running out of power during their daily activities. Third, consumer education plays a key role in helping buyers know about available incentives, understanding the impacts of EV use, and reducing confusion on how to use the technology. Finally, the cost of the new technology limits the market. Policies and incentives will help encourage a successful penetration into the mass market.

Predicted EV Demand

Projections for alternative fuel vehicles are often difficult because it is unclear whether the availability of infrastructure drives the demand for vehicles or does increased vehicle deployment result in higher infrastructure demand. The case is no different for the EV market. There are a number of studies documenting projected demand for EVs, and the results are widely varied. In March 2012, the South Carolina Institute for Energy Studies (SCIES) completed a report as part of the Southeast Regional EV Readiness Planning Program. The SCIES report examined a number of the existing studies and conducted its own demand analysis for the Tri-State region of Alabama, Georgia, and South Carolina.

The SCIES report documents the variations in several previous studies designed to project EV demand. The study identified the factors that led to the variation in predicted sales, which varied by as much as a factor of 4, and included:

- Vehicle price
- Vehicle performance, safety, and reliability
- Government incentives
- Availability of charging infrastructure at home, work, and other destinations
- Relative prices of gasoline and electricity
- Projected improvements in fuel efficiency of petroleum fueled vehicles

SCIES approached their predictions of demand using a model to forecast how products are adopted. SCIES modeled both a baseline scenario and an accelerated adoption scenario for total estimated EV market forecast for Alabama, Georgia, and South Carolina. The Baseline Demand Scenario assumes that there are no incentives available to encourage purchase of EVs. The Baseline Demand Scenario also assumes that EVs will enter the market at a similar rate as hybrid vehicles. However, SCIES noted that the current market conditions differ from the introduction of hybrid vehicles; for example, the federal government's support to the auto industry as well as the state and federal subsidies per vehicle are higher and more likely to increase the rate of adoption. In addition, the significant increase in gasoline prices and recent tension in the Middle East could converge to increase the rate of adoption by a factor of two. Therefore, SCIES created an Accelerated Demand Scenario, accounting for the increased likelihood of these influences on the market. As a result, the Accelerated Demand Scenario assumes that incentives such as tax credits or rebates, favorable off-peak utility rates, and HOV lane access are available to consumers.

Table 5 highlights the estimated cumulative EV demand projected for 2015 and 2020 under the Baseline Demand Scenario. By comparison, the Accelerated Demand Scenario is provided in Table 6. Figure 2 provides a profile of both scenarios over a ten year period, from 2011 through 2020.

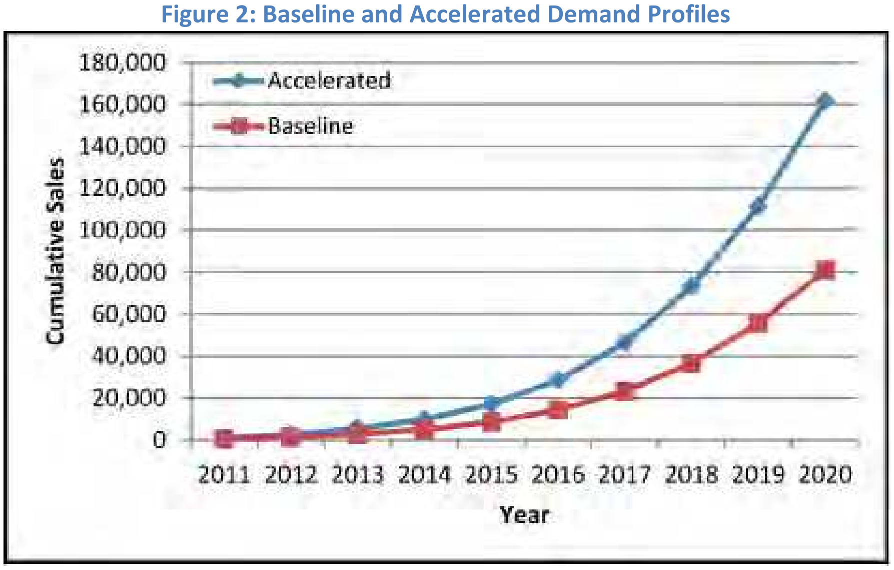
Table 5: Baseline Demand Scenario

STATE	2015 Estimated EV Demand	2020 Estimated EV Demand
Alabama	1,785	16,866
Georgia	4,435	41,924
South Carolina	2,332	22,050
TOTAL	**8,552**	**80,840**

Table 6: Accelerated Demand Scenario

STATE	2015 Estimated EV Demand	2020 Estimated EV Demand
Alabama	3,570	33,732
Georgia	8,870	83,848
South Carolina	4,664	44,100
TOTAL	**17,104**	**161,680**

Figure 2: Baseline and Accelerated Demand Profiles



The SCIES report examined the impact on the grid and examined how the infrastructure would need to be distributed throughout the region. When considering the total load on the grid, the SCIES study reported that most utility research and third party studies agree that electric power generation, transmission, and much of the distribution system in the Southeast will be able to handle the added power demand from EVs for the foreseeable future.

The distribution of charging infrastructure is key to provide optimal charging opportunities for EV operators. The SCIES report examined charging equipment distribution for a projection of 100,000 EVs in the Tri-State region and projected energy consumption by location. The study considered residential charging, workplace charging, and public charging. The report concluded 57% of all charging would occur at home, workplace charging would account for 26% of all charging, and 17% of charging would occur at destination charging stations.

Charging Station Distribution

One of the issues associated with EV deployment is the impact EV use would on the electric power grid. The SCIES Report determined that almost 54,000 of the 100,000 estimated vehicles deployed in the Tri-State area will be located in core cluster areas (e.g., Birmingham, Atlanta, Savannah, Charleston, and Greenville-Spartanburg). The impact on the core clusters would be total of 186,500MWh of electricity consumed annually, which assumes all locations are equipped with Level 2 EVSE. The simulations indicate that 57% of all charging would be done at home (with two-thirds of all locations having annual residential charging levels of less than 400 MWh); that 26% of all charging would take place at a workplace (with two-thirds of all locations having annual work charging levels of less than 150MWh); and that 17% of total EV charging would be done at public charging stations (having annual charging levels of less than 100 MWh).

Grid Impact

Utilities and third parties conclude that electric power generation will be able to keep up with the added demand for EVs for the foreseeable future.[18] In August 2012, Southern Company and the South Carolina Institute for Energy Studies (SCIES) completed a peak loading and grid impact assessment[19] as part of the Southeast Regional EV Readiness Planning Program. The intent of their report was to help determine if there would be a peak loading problem due to EV charging in the Tri-State region and where it would likely occur. Based on the analysis of circuit data for zip codes in the Tri-State area, the capacity of the existing utility system grid infrastructure is adequate to accommodate the installation of 100,000 EVs. In fact, the existing utility grid infrastructure could comfortably accommodate 1,000,000 EV's in the Tri-State area with minimal impact other than at the point of service. Further, there are reasonable and effective means to drive EV charging off-peak to go well beyond 1,000,000 Tri-State EVs.

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[18] Deloitte. (2012). "Charging Ahead: The Last Mile Is the U.S. electric infrastructure ready to support one million electric vehicles?". Retrieved October 16, 2012, http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/Energy_us_er/us_er_ChargingAhead_ExctvSummary_May2012.pdf

[19] See Section III: Electric Vehicle Adoption in the Southeast Peak Loading Addendum; Southern Company and South Carolina Institute for Energy Studies, August 2012

In terms of distribution, initial purchases of EVs will gravitate and cluster to higher income and environmentally conscience residential areas and places of work. The distribution effect may result in local loads that exceed the rating of local distribution lines and transformers, when charging occurs at peak times and high rates of EVs are used. To mitigate this issue, the “hot spots” may need to have transformers replaced with higher load rated units. However, utilities will be able to easily identify and mitigate any hot spot issues as they develop over time.

EV Readiness Stakeholders

There are a variety of stakeholders that play a role in supporting a community's efforts to become EV Ready. Each stakeholder is essential in providing support to ever other stakeholder in a symbiotic relationship, also known as the "EV Eco-vironment." This section identifies these stakeholders and discusses their roles in promoting EV Readiness.

Government

The public sector can play a pivotal role in promoting a community's EV Readiness. Local governmental stakeholders are responsible for updating building codes and zoning regulations, parking rules, and other local ordinances, as well as revising permitting and inspection processes to support the installation of charging equipment and the development of charging station networks. State governments are engaged in policy and incentive legislation to support mass-market adoption of EVs. In addition to the roles discussed below, Section II of the workbook includes a more in-depth discussion of government's role in EV Readiness. Section II also includes a checklist for governments with actions they may consider in order to enhance their community's efforts to become EV Ready.

Local governments can improve codes and policies

- Streamlining permitting processes improves the efficiency of **EVSE/Electrical Contractors** and incentivizes the charging equipment installation process for **Property and Facility Managers**.
- With proper zoning ordinances, **Property and Facility Managers** can install charging equipment without HOA/zoning restrictions and **EVSE OEM's and Dealers** can develop networks of publically available charging stations

State and federal governments provide incentives

- Federal, State, and local incentives (i.e., tax credits, rebates, off-peak charging rates, preferred parking, etc.) generates demand for EV's, creating manufacturing jobs for **EV and EVSE OEM's**, sales and service jobs **for EV and EVSE Dealers**, and installation jobs for **EVSE/Electrical Contractors**
- *Governments and other non-tax paying entities would be eligible for incentives if they were rebates rather than tax-credits.*

Local and state government entities can provide publically accessible infrastructure and increase the number of electric vehicles on the road

- Local and state governments can incorporate electric vehicles into their fleets and bus systems (where possible)
- Local and state governments can install or facilitate the installation of charging stations for public use.

Outreach

- Government can create a clean fuels committee that will efficiently educate the community and promote the adoption of EVs.
- Government should invite and participate in Clean Cities programs.
- Education and outreach can be as simple as signage on government-owned EVs or giving Government employees information about EVs that they can share with others.

Fleets

Fleet Managers play an important role in supporting the community's EV Readiness efforts. By incorporating electric vehicles into their fleets, local business, organizations and governments demonstrate the viability of the technology, as well as their commitment to the vitality of the local community. Both public and private fleets are community stakeholders. In addition to the roles discussed below, Section II of the workbook includes a more in-depth discussion of a fleet's role in EV Readiness. Section II also includes a checklist for fleets of actions they may consider in order to enhance their community's efforts to become EV Ready.

Fleet Managers create demand for EVs

- Fleet managers have the potential to create the largest initial demand for EVs and charging equipment, benefitting **EV and EVSE OEMs and Dealers**.
- Fleet managers can also contribute to community EV Readiness by providing publically available infrastructure.

Fleet Managers create jobs

- The larger the fleet of EVs, the more charging stations required, resulting in manufacturing jobs for **EV and EVSE OEMs** and installation/management jobs for **EVSE Contactors**.

Fleet Managers create outreach opportunities

- Fleet managers can participate in the local clean fuels committee that will efficiently educate the community.
- Fleet managers should invite and participate in Clean Cities programs.
- Education and outreach can be as simple a signage on an EV or giving drivers information they can share with others
- Use public relations to communicate their suceess stories with other local fleet managers.

Property & Facility Managers

This stakeholder group includes owners and operators of property (i.e., multi-family property management companies, parking property management companies, retail and commercial property managers, refueling stations, convenience stores, hotels), government property and facility managers (i.e., public buildings, libraries, post offices, airports), and employers that provide employee parking at their facilities. In addition to the roles discussed below, Section II of the workbook includes a more in-depth discussion of property managers' and employers' roles in EV Readiness. Section II also includes a checklist for property & facility managers with actions they may consider in order to enhance their community's efforts to become EV Ready.

Property & Facility Managers create demand for EVSE

- Property Managers will provide the most publicly available charging stations for destination and workplace charging, supporting **EVSE OEMs & Dealers,** as well as **EVSE/Electrical Contractors.**
- Facility Managers will develop workplace charging , supporting **EVSE OEMs & Dealers,** as well as **Electrical Contractors.**

Property & Facility Managers create jobs

- As Property Managers meet the requirements of their tenants/clients and Facility Managers meet the charging requirments for their employers, manufacturing jobs for **EVSE OEMs** and installation jobs for **EVSE/Electrical Contactors** will be supported.

Property managers can incentivize electric vehicle adoption through parking regulations

- Parking easements for EV owners and those who are charging add to the list of reason to purchase an electric vehicle.

EVSE installations serve as marketing campaigns.

- Public EV charging infrastructure will reduce range anxiety of potential EV adopters.
- Public Charging stations at retail and commercial locations can differentiate a business and draw attention to create a competetive advantage.

Other Key Stakeholders

In addition to the stakeholders discussed above, other stakeholders in the community can contribute to EV Readiness efforts. These stakeholders, along with a brief discussion of their roles, are identified below.

Utilities

Utilities generate and provide the energy for electric vehicles. Utilities can adopt rate structures that lower the cost to recharge vehicles during off-peak hours. Utilities can also help to educate consumers on the benefits of EVs.

Utilities provide the fuel for EVs.

- **EV OEMs and Dealers, Property Managers, and Fleet Managers** rely on utilities to upgrade transmission technology to support EV charging loads.

Utilities provide smartgrid technologies

- Upgraded smartgrid technologies and the education on smartgrid is passed on to consumers through **EVSE Contractors**.

Utilities can incentivize EV purchases

- Utilities can provide incentives to consumers, **Fleet Managers, Property Managers, and Facilties Managers** through tiered/Time of Use rate plans, renewable energy buyback programs, and technology rebates.

Utilities Educate and Market EV and EVSE Incentives

- Utilities can influence the market by educating consumers, **Fleet Managers, Property Managers, and Facilties Managers**on the benefits of EVs.

EV Manufacturers and Dealers

EV manufacturers and dealers are key stakeholders as they are producing, selling and servicing EVs.

EV OEMs provide training for dealers

- EV OEMs should provide the proper educational material and training to **EV Dealers** so they can convey the technical facts as well as the benefits of electrically fueled vehicles. OEMs can leverage resources such as Clean Cities coalitions and other clean fuels coalitions for educational materials.

EV Dealers are the point source of information to the public

- EV Dealers can educate **Consumers** and **Fleet Managers** who are ready to buy a vehicle but do not know anything about EVs.
- Ride and Drive events as well as pilot EV car share programs are the best way to expose consumers to the technology.

EVSE Manufacturers and Dealers

Like the vehicle OEMs, EVSE manufacturers and dealers are key stakeholders as they produce the equipment for at-home charging and publically accessible charging stations that support infrastructure deployment. Several have also established local, regional, or nationwide networks of charging stations.

EVSE OEMs provide educational material

- EVSE OEMs can educate **EVSE Dealers and EVSE/Electrical Contractors** about EV charging technologies.

EVSE Dealers are the point source of information to consumers

- EVSE Dealers can educate **Fleet Managers and Property/Facilities Managers**. EVSE OEMs should make sure **EVSE/Electrical Contractors** understand EVSE specifications and installation procedures.

EVSE OEMs develop marketing campaigns.

- EVSE OEMs and Dealers should market their technologies to all consumers, especially **Fleet Managers and Property/Facilities Managers**.

EVSE/Electrical Contractors

EVSE/Electrical contractors include EVSE installers, electrical contractors, and electricians. These are key stakeholders because they are responsible for installation of charging equipment and have direct interaction with the EV consumer.

EVSE/Electrical Contractors educate consumers.

- As the link between EVSE OEMs and the consumer, EVSE/Electrical contractors provide technical information to **Fleet Managers and Property/Faclities Managers**.
- EVSE Contractors can provide the technical support to incoporate renewable/decentralized energy generation for charging stations.

Electric Vehicle and Electric Vehicle Supply Equipment Overview

About the Technologies

There are a number of electric vehicles and electric vehicle supply equipment (EVSE) currently available on the market. The technology is constantly progressing and new products are introduced at a rapid pace. This overview provides a brief introduction to 2012 model year EVs, as well as the types of EVSE currently available. There are many on-line information sources that provide the most up-to-date information on the latest technologies, such as the U.S. Department of Energy's Alternative Fuels Data Center (http://www.afdc.energy.gov/vehicles/electric_availability.html) and the Electric Drive Transportation Association (www.goelectricdrive.com). Appendix A of this section includes frequently referenced EV Ready terms and definitions.

Electric Vehicles

Electric vehicles are a category of vehicle that uses electricity either as their primary fuel or to improve the efficiency of conventional vehicle designs. Generally, this category includes Hybrid-Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and All-Electric or Battery Electric Vehicles (BEVs). The focus of this workbook includes those EVs that plug-in to an external energy source to recharge the vehicles batteries such that the vehicle can operate solely on energy stored in the batteries (PHEVs and BEVs).

Battery Electric Vehicle

All-Electric or Battery Electric vehicles (BEV) use an electric motor instead of an internal combustion engine to propel the vehicle. They are totally dependent on plugging into an electric power source to recharge the battery system and typically have a range of 70 to 300 miles, depending on the size of the battery pack installed on the vehicle. Examples include the Nissan Leaf, Tesla Sedan, Coda, Ford Focus EV, Honda Fit EV, and Mitsubishi I MiEV

Plug-in Hybrid Electric Vehicle

PHEVs are powered both by an electric motor and internal combustion engine in either a parallel or series configuration. In a parallel hybrid, both the electric motor and the internal combustion engine are connected to the drive train such that either the motor or the engine propels the vehicle. These vehicles may run 10-15 miles in all-electric mode. Otherwise it operates similar to an HEV. An example is the Toyota Prius Plug-in.

In a series hybrid, the vehicle is propelled only by the electric motor. A small internal combustion engine is used as a generator to recharge the batteries while en route. The battery is recharged by plugging the vehicle into an electric power source. These vehicles may run up to 40 miles in all-electric mode. The internal combustion engine will start running only after the batteries are depleted giving the vehicle a range of over 300 miles. As a result, this type of PHEV is also known as an Extended Range Electric Vehicle (EREV). Examples include the Chevy Volt and the Fisker Karma.

When purchasing an EV, consumers may consider issues such as the vehicle's charging capabilities and capacity, along with its range. The model for fueling an electric vehicle is substantially different than fueling an internal combustion engine. Consumers will have the ability to recharge their EV's batteries at home, overnight. In addition, many employers will offer workplace charging and EV owners will find public charging stations at a variety of destinations including retail stores and restaurants. Each of these locations may provide different levels of charging capability, including Level 1, Level 2 and DC Fast Charging, which will directly affect charging time. Fortunately, electric vehicles communicate with the charging equipment to match power requirements in amperage to avoid overcharging the vehicles. Table 5 lists EVs available in the 2012 model year and their respective range and recharging times.

Table 5: BEVs and PHEVs: Range and charging time.

Plug-in Electric Vehicle Model	Batter Capacity (kWh)	Vehicle Range on Full Charge (miles)	Extended Vehicle Range (miles)	Hours to Fully Charge Battery from Empty	
				Level 1 (110/120V)	Level 2 (220/240V)
Battery Electric Vehicles					
2012 Coda Sedan(1)	33.8	125	n/a	20	6
2012 Ford Focus Electric(2)	23	76		18	3.5
2012 Mitsubishi I MiEV(3)	16	62		22.5	7
2012 Nissan Leaf(4)	24	73		20	4
2012 Tesla Sedan(5)	85	300		64	16
2012 Wheego LiFe(6)	30	100		20	5
Plug-in Hybrid Electric Vehicles					
2012 Chevrolet Volt(7)	16	25-50	344	10	3
2012 Fisker Karma(8)	16.2	50	300	14	6
2012 Plug-in Prius(9)	4.4	11	520	3	1.5
2012 VIA E-REV Truck(10)	24	40	400	10	3

Data in this table was included on the individual manufacturer's web sites listed below. For additional information on the vehicles included in the table, please visit the manufacturers' web sites

(1) www.codaautomotive.com/electric-car-price-cost-of-ownership
(2) www.ford.com/electric/focuselectric/2013/
(3) www.i.mitsubishicars.com/miev/charging/battery
(4) www.nissanusa.com/leaf-electric-car
(5) www.teslamotors.com/models/charging
(6) www.wheego.net/more/vehicles/specs
(7) www.gm-volt.com/full-specifications
(8) www.fiskerautomotive.com/en-us/about/faq
(9) www.toyota.com/prius-plug-in
(10) www.viamotors.com/powertrain

Electric Vehicle Supply Equipment

Electric Vehicle Supply Equipment (EVSE) provides for the safe transfer of energy between electric utility power and the electric vehicle. The EVSE consist of the connector, the cord, and the interface to utility power. The EV charger itself is typically part of the EV. The Society of Automotive Engineers (SAE) has agreed all EVs deployed in the U.S. will be equipped with a single connector design called the SAE J1772. This standard supports communication between the EV and the EVSE to identify circuit ratings and adjust the charge accordingly.

Consumers will have a choice of charging options which directly affect the amount of time to recharge an EVs batteries. The different types of charging are as follows:

- **Level 1 – 120 volt AC**
  Level 1 charging uses a standard 120 volts AC (VAC) branch circuit, which is the lowest common voltage level found in both residential and commercial buildings. Typical voltage ratings can be from 110 – 120 volts AC. Typical amp ratings for these receptacles are 15 or 20 amps.
- **Level 2 – 240 volt AC**
  Level 2 charging may be utilized for both private and publicly available facilities, and specifies a single-phase branch circuit with typical voltage ratings from 220 – 240 volts AC. The SAE J1772 connector allows for current as high as 80 amps AC (100 amp rated circuit).
- **Direct Current (DC) Fast Charging**
  DC Fast Charging is intended to perform in a manner similar to a commercial gasoline service station. Typically, DC Fast Charging would provide an 80% recharge in 30 minutes.

General Considerations for EVSE installations

The Clean Cities PEV Handbook for Fleet Managers [20] provides information on vehicles, maintenance, safety, emissions, charging equipment and more. The handbook also points fleet managers to a host of resources and information that can help them successfully incorporate PEVS into their operation.

- **Compliance:** EVSE should meet the appropriate codes and standards and must be certified and so marked by a nationally recognized testing laboratory (e.g., UL). EVSE should be installed to standards outlined in the National Electric Code (NEC) Section 625. Government inspectors may differ in what NEC publication they inspect to (2005, 2008 or 2011).
- **Protection:** EVSE should be positioned in a way that allows a physical barrier for its protection. Wheel stops or bollards may be used to prevent a vehicle from contacting the EVSE, depending on how the property owner wants to mitigate risk.
- **Convenience:** Locate EVSE and associated PEV parking as close as possible to the electric service while accommodating other activities within your facility. Keep in mind that PEVs can be parked for hours at a time for charging.

[20] Clean Cities PEV Handbook for Fleet Managers. U.S. Department of Energy. April 2012

- **Avoiding Hazards:** Cords and wires associated with EVSE should not interfere with pedestrian traffic or present tripping hazards. PEV charging spaces should not be located near potentially hazardous areas.
- **Ventilation:** Although most of today's advanced batteries do not require ventilation during charging, some older types emit gases during charging. If PEVs are charged with these types of batteries in an enclosed space, there must be adequate ventilation, which may include installation of fans, ducts, and air handlers. Depending on the installation, the National Electrical Code may also require ventilation. Verify the requirements with the PEV manufacturer's documentation.
- **Battery Temperature Limits:** Because some PEV batteries have operating- and charging-temperature limits, EVSE may need to be located within an enclosed, climate-controlled area in extreme climates.
- **Pooled Water and Irrigation:** EVSE is designed to operate safely in wet areas. However, users will be more comfortable if it is not located where water pools or where irrigation systems spray.
- **Preventing Impact:** Curbs, wheel stops, and setbacks should be used to prevent PEVs from colliding with EVSE. However, accessibility issues must also be considered when using these strategies.
- **Vandalism:** Assess the risk of vandalism and minimize risk through use of preventive strategies, such as motion detectors, security lighting, tamper alarms, and locked enclosures.
- **Signage:** Use signs that can be seen over parked vehicles to designate PEV-only parking spaces. Any publically accessible EVSE installed that is not visible from the street would benefit from street-side signs directing drivers to the charging station.
- **Accessibility:** Evaluate and address requirements for complying with the Americans with Disabilities Act, as well as state, local, and organizational accessibility policies. Compliance measures may include adjusting connector and receptacle heights, cutting curbs, and providing handicap-accessible parking spaces.

EV and EVSE Incentives

A number of major cities and regions in the US are committed to making electric mobility a reality. They are actively pursuing ambitious deployment goals through a variety of innovative policy measures and programs. Many cities employ a mix of financial and non-financial incentives to boost demand for vehicles and charging infrastructure. The section below reviews types of both financial and non-financial incentives available as of July 2012 (See EV Readiness in the Southeast - Incentives in Section III for details on incentives available in the Southeast).

Plug In America (http://www.pluginamerica.org/incentives) and the U.S. Department of Energy's Alternative Fuel Data Center (http://www.afdc.energy.gov/laws/) both include detailed information on federal and state incentives.

Table 6: Financial Incentives

Incentive	Who's Responsible
Rebates or tax credits on vehicles	Federal and state governments
Exemptions from vehicle registration taxes or license fees	State governments
Discounted tolls and parking fares	City, county, and state governments and property managers
Tax rebates for charging equipment and installation	Federal and state governments
Discounted electricity rates for EV users from utilities	Utilities

Table 7: Non-Financial Incentives

Incentive	Who's Responsible
Dedicated parking spaces	Property managers, employers, local governments
Access to restricted highway lanes	State governments
Expedited permitting and installation of electric vehicle supply equipment	Local governments

Private fleets in the Tri-State region interested in purchasing electric vehicles and EVSE can take advantage of federal tax credits, and in some cases, state tax credits. In Georgia, a non-financial incentive exists which allows single-occupant alternative fuel vehicles access to the High-Occupancy Vehicle (HOV) and High Occupancy Toll (HOT) lanes. In some cases, incentives are available from the local utility.

Descriptions of the federal incentives as well as the incentives available (by state) in the Tri-State region are included below.

Federal EV Incentives

Up to $7,500 Income Tax Credit: The federal government provides a tax incentive towards the purchase of a new electric vehicle. This financial incentive takes the form of a tax credit, going towards the purchaser's tax bill for the year of purchase.

Important stipulations

- The Federal tax incentives only apply to purchasers of new electric vehicles. Pre-owned or leased vehicles do not apply.

(Some leasing arrangements might provide credit towards the down payment.)

- The full balance of the tax credit must be put towards the current year's income tax; any remainder of the $7,500 is otherwise forfeit, and will not be transferred to the following year.
- The vehicle must be used primarily in the United States.
- Plug-in hybrids and battery-electric vehicles must be equipped with battery packs rated for at least 4 kilowatt-hours or greater, and must be capable of being charged from an external source.
- More details can be found in the Internal Revenue Code Section 30D[21]

Incentives in the Tri-State Region

Alabama Incentives

Charging Rate Incentive (PEV) – Alabama Power[22]: Alabama Power offers a Business Electric Vehicle Time-of-Use (BEVT) rate for electricity purchased to charge EVs used for non-residential purposes. The electricity used for vehicle charging is metered separately from all other electricity use. This rate is available to non-residential customers only. Other restrictions apply.

Georgia Incentives[23]

$5,000 Income Tax Credit (ZEV): The State of Georgia offers an income tax credit for 20% of the cost to purchase or lease a new Zero Emission Vehicle (ZEV) capped at $5,000 per vehicle. All pure battery electric vehicles qualify as zero emission vehicles. Any portion of the credit not used in the year the ZEV is purchased or leased may be carried over for up to five years.

$2,500 Income Tax Credit (LEV): The State of Georgia offers an income tax credit for 10% of the cost to purchase or lease a new dedicated Alternative Fuel Low Emission Vehicle (LEV) or to convert a vehicle to operate solely on an alternative fuel that meets the standards for a low emission vehicle, up to $2,500 per vehicle. It is important to note that this incentive **does not apply to hybrid electric, flex fuel, or bi-fuel vehicles**. Any portion of the credit not used in the year the LEV is purchased or converted may be carried over for up to five years.

[21] http://www.irs.gov/Businesses/Plug-In-Electric-Vehicle-Credit-(IRC-30-and-IRC-30D)
[22] http://www.alabamapower.com/business/pricing-rates/pdf/BEVT.pdf
[23] http://www.afdc.energy.gov/laws/state_summary/GA

$2,500 Income Tax Credit (EVSE): An eligible business enterprise may claim an income tax credit for the purchase or lease of qualified EVSE, provided the EVSE is located in the state and accessible to the public. The amount of the credit is 10% of the cost of the EVSE and installation, up to $2,500.

AFV License Plate & HOV/HOT Lane Peach Pass Access: The State of Georgia offers a special license plate for alternative fuel vehicles, which allows access to the designated HOV lanes. Any vehicle that has been certified by the EPA in accordance with the Federal Clean Air Act may apply for the Georgia AFV License Plate. Alternative fuel vehicles displaying the proper AFV license plate may use HOV lanes, regardless of the number of passengers.

EVSE Utility Rate: Georgia Power offers a Plug-in Electric Vehicle (PEV) time-of-use electricity rate [24] for residential customers who own an electric or plug-in hybrid electric vehicle which provides a discount on electricity during night time hours, 11 p.m. until 7 a.m. The PEV rate is optional and does not require a separate meter.

South Carolina Incentives[25]

$2,000 Income Tax Credit (PHEV): The State of South Carolina offers an income tax credit for plug-in hybrid vehicles equal to $667, plus $111 if the vehicle has at least five-kilowatt hours of battery capacity, plus an additional $111 for each kilowatt-hour of battery capacity in excess of 5kWh. The maximum credit allowed by this section is $2,000.

Other Incentives throughout the US

In addition to the incentives available in the Tri-State region, a number of other states and localities throughout the U.S. have adopted incentives to support the deployment of EVs and EVSE. The following section highlights other incentives enacted in support of EVs.

City of Los Angeles

LADWP Residential EV & Charger Installation Incentives:[26]
Rebates worth up to $2,000 for the first one thousand Los Angeles Department of Water and Power (LADWP) customers who install electric charging station at their home.

[24] http://www.georgiapower.com/pricing/residential/plugin-vehicles.cshtml
[25] http://www.afdc.energy.gov/laws/state_summary/SC
[26] http://www.socalev.org/plugin/incentives.htm

Time of Use Rates Similar to those in Georgia and South Carolina:[27]
Many utilities, including the Los Angeles Department of Water and Power and Southern California Edison, offer special rates for electricity used to charge your PEVs through "time of use" rates, which offer a financial incentive to use electricity during "off-peak" hours, when charging is most likely to happen.

New York City[28]

New York City Private Fleet Program: The New York City Private Fleet Program provides significant incentives for the purchase of medium- and heavy-duty electric vehicles.

NYSERDA will also support funding for other alternatively fueled vehicles.

City of Cincinnati[29]

All-Electric Vehicle Free Parking Program

The City's All-Electric Vehicle Incentive Pilot Program offers FREE parking to all-electric vehicles at three city-owned garages and one city-owned parking lot located in the downtown area. This incentive program also includes free parking to all-electric vehicles at any parking meter within the Cincinnati city limits.

State of Nebraska[30]

Dollar and Energy Savings Loan Program

BEVs and PHEVs qualify for Nebraska's Dollar and Energy Saving Loan Program. Maximum loan amount is $750,000 per borrower, at an interest rate of 5% or less.

State of Oregon[31]

Business Energy Tax Credits

Oregon business owners and others who invest in new hybrid-electric vehicles for business use can receive a state Business Energy Tax Credit. **Qualifying hybrid-electric vehicles are pre-certified for the Oregon Department of Energy's Business Energy Tax Credit**: Up to 35% of the incremental cost between an internal combustion vehicle and an EV in Oregon Business Energy Tax Credits (BETC).

[27] https://www.ladwp.com/ladwp/faces/ladwp/residential
[28] http://www.nyserda.ny.gov
[29] http://www.cincinnati-oh.gov/oeq/residential-programs/electric-vehicle-free-parking/
[30] http://www.neo.ne.gov/loan/index.html#typical
[31] http://www.oregon.gov/ENERGY/CONS/BUS/Pages/BETC.aspx

Industry Impacts

Seventy percent of all petroleum used in the U.S. is dedicated to transportation. Currently, the US imports 45% of the petroleum consumed in the US[32]. By contrast, electricity is primarily produced by domestic sources such as coal, nuclear, natural gas, and an increasing percentage of renewable energy such as hydroelectric, solar, and wind. By shifting from petroleum-based transportation to electric-based transportation, we can have a dramatic impact on energy security, air quality, and our economy.

The U.S. spends $67 billion to $83 billion annually [33] to protect U.S. oil imports. Instability of oil producing countries lead to price increases for gasoline which negatively impacts the U.S. economy. Shifting to U.S. sources of energy decreases our reliance on foreign governments, allowing the U.S. to effectively manage its own energy policy.

As the demand for EVs grows, the economy will shift and new job sectors will develop. The development of the EV market will have an economic impact by creating the following types of jobs:

- EV and parts manufacturing, sales, and service
- EVSE manufacturing, sales, installation, and service
- Battery research, development, manufacturing, sale, service, and recycling

The U.S. spends nearly $1 billion per day for imported oil. As more consumers choose EV's, we are able to keep that spending within the US economy. Furthermore, energy spending for EVs is kept locally as gasoline purchases are displaced by locally produced electricity purchases, keeping energy spending within the respective states. For example, in Georgia, about 90% of gasoline and diesel revenue is diverted out-of-state. By comparison, only about 40% of electricity revenue is shifted out-of-state to purchase and transport source fuels, like coal. As a result, shifting from gasoline-powered vehicles to electric vehicles will return approximately $1,400 per EV annually to the Georgia economy.

Life Cycle Emissions

Electric vehicles have the benefit of no tail-pipe emissions, resulting in cleaner air and improving the health and wellness of the local community. Transportation emissions are among the leading causes of asthma and lung disease, especially among children and the elderly.

However, it is important to recognize the life cycle impact of EVs in comparison to gasoline-powered vehicles. Depending on the fuel source, production of electricity may emit greenhouse gases and EV manufacturing has a higher carbon intensity than traditional gasoline vehicles due to the batteries. **Error! Reference source not found.**3 illustrates the lifecycle emissions for conventional vehicles, HEV,

[32] U.S. Energy Information Administration. *Monthly Energy Review*. March 2012.
[33] Electric Drive Transportation Association, Electric Car Facts; http://electricdrive.org/index.php?ht=d/sp/i/27132/pid/27132

PHEV, and EVs.[34] The carbon intensity for this analysis is assumed to be 500gCO2/kWh for the production of electricity, slightly lower than the carbon intensity for electricity generation in the Tri-State region, which is estimated to be 600 gCO2/kWh.

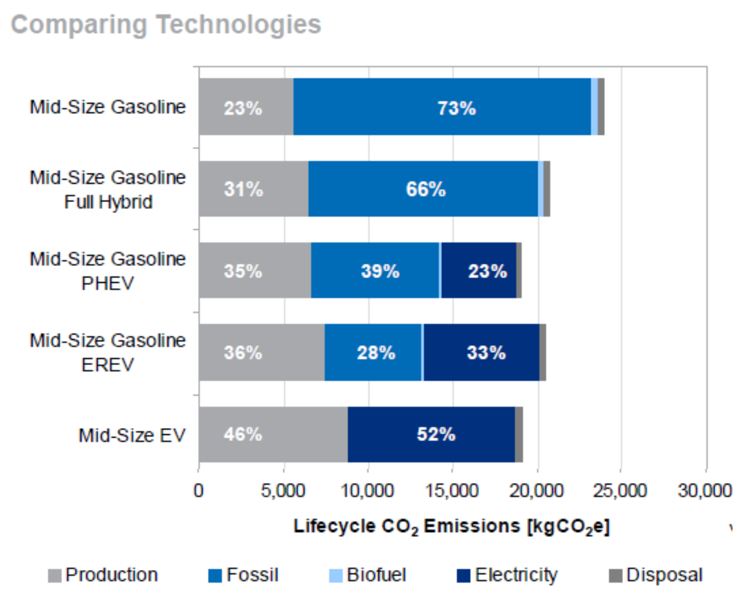

Figure 3: Relative CO2 Emissions per Technology (Low Carbon Vehicle Partnership, Ricardo. 2011).

The life cycle assessment results shown in **Error! Reference source not found.**5 suggest that the life cycle emissions from electric vehicles are less than the life cycle emissions from a conventional vehicle, HEV, EREV, and PHEV. It is important to note that, as electricity generation adds renewable energy sources such as wind, solar, and hydro, the electrical generation mix will become less CO_2 intensive. As a result, the life cycle emissions on a mid-size EV will continue to drop overtime.

[34] Patterson, Jane, Marcus Alexander, and Adam Gurr. *Life Cycle CO2 Measure Final Report*. Low CVP, 25 Oct 2011. Web. Accessed 21 Oct 2012. http://www.lowcvp.org.uk/assets/reports/RD11_124801_5 - LowCVP - Life Cycle CO2 Measure - Final Report.pdf.

The Southeast Regional Electric Vehicle Readiness Planning Program

Overview

In partnership with Clean Cities Atlanta, Palmetto State Clean Fuels Coalition, Alabama Clean Fuels Coalition, and the City of Atlanta, the Center for Transportation and the Environment was awarded $545,000 from the US Department of Energy to create an EV Readiness plan for the Tri-State region. The Southeast Regional Electric Vehicle Readiness Planning Program (SEREVRPP) was one of 16 projects that received Department of Energy funding in September 2011, see **Error! Reference source not found.**4.

Figure 4: Electric Vehicle Community Readiness Projects.

The primary objective of the SEREVRPP is to establish a comprehensive, Tri-State EV/EVSE Readiness and deployment strategy and begin implementation of the community based Southeast Regional EV Deployment Readiness Plan in anticipation of larger electric vehicle deployment efforts in the near future. The project objectives support DOE’s program objectives by preparing the Tri-State region for mass market adoption of EVs.

The project team has identified key population centers that will be the focus for EV deployment. These EV Deployment Clusters (see Figure 5) consist of cities, counties, and communities surrounding major metropolitan areas in the Tri-State region and will be the target of EV/EVSE deployment readiness implementation activities. The original model shows these clusters connected by Charging Corridors, which consists of Corridor Anchor communities along major thoroughfares.

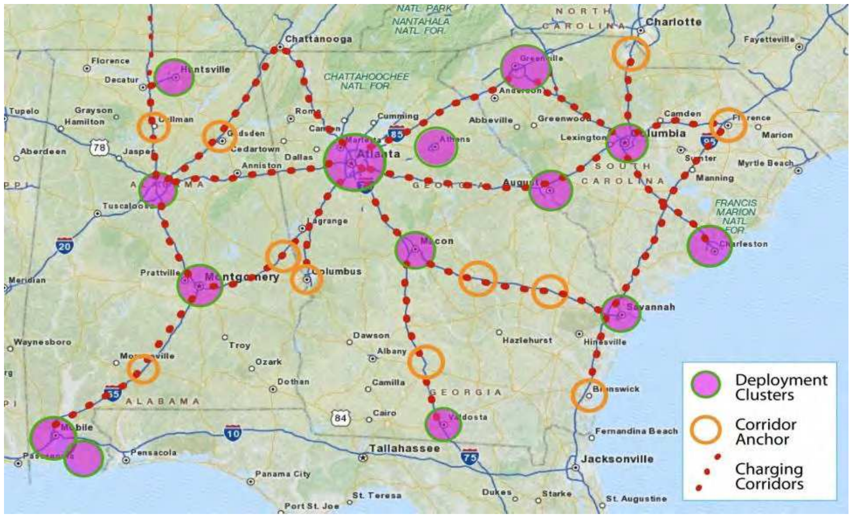

Figure 5: SEREVRPP Cluster Cities

The SEREVRPP includes the following program objectives, tasks, and deliverables:

EV/EVSE Demand and Impact Analysis

Task 1: EV Demographic Analysis: Determine demographics of EV purchases across all segments, including individuals, public and private fleets.

Task 2: EV Demand Forecast: Determine projected volumes and locations of EV deployments.

Task 3: Elasticity of Demand Analysis: Determine impact on demand at various pricing levels of EVs, EVSE, electricity and gasoline.

Task 4: EVSE Demand and GIS Analysis: Determine EVSE distribution requirements using a Geographic Information System (GIS) to project EV deployments and demographic utilization profiles.

Task 5: EV/EVSE Grid Impact Analysis: Determine the impact that EV/EVSE will have on existing generation, transmission, and distribution (GTD) assets in each state and assess how different charging scenarios influence the number of EVs that can be recharged from the grid without adding GTD capacity. Assess the potential for bottlenecks in the grid in deployment locations. Develop a plan to address any identified weaknesses with respect to the demand and utilization forecast.

Task 6: Smart Grid Analysis: Assess the benefits and costs of employing Smart Grid technologies to optimize the use of available grid resources. Determine the impact of deployment on of Smart Grid technologies. The study results will support the resource planning efforts of the utilities in each state and be incorporated into policy and incentive discussions.

Analysis of EV/EVSE Deployment Barriers and Solutions

Task 1: Stakeholder Workshops: Plan, schedule, and conduct stakeholder workshops. The recipient will conduct a series of workshops to engage stakeholders in defining the policies, incentives, and procedures procedural barriers to EV/EVSE deployment and discuss potential solutions. Conduct required analysis to finalize solutions to establish regional/local policies, incentives and procedures. Define associated EV/EVSE readiness tasks.

Community EV/EVSE Deployment Readiness Plan Pilot

Task 1: Draft Southeast Regional EV Deployment Readiness Plan: Develop and finalize a community based electric vehicle infrastructure readiness plan.

Task 2: Pilot Southeast Regional EV Deployment Readiness Plan: Deploy the plan for communities to execute readiness tasks identified. Obtain feedback on the success of implementing policies, incentives and procedures.

Task 3: Finalize Southeast Regional EV Deployment Readiness Plan: Using feedback from the pilot plan deployments, finalize the plan and prepare for distribution across the region.

EV/EVSE Deployment Readiness Communications & Outreach

Task 1: Define Southeast Regional EV Deployment Grant Model: To support the deployment of EV/EVSE, the project will develop a model to prioritize EV/EVSE deployment to communities.

Task 2: Develop Communication Plan & Templates: Communications templates will be created and distributed.

Task 3: Conduct Public Relations Campaign

Task 4: Conduct Community Workshops

Task 5: Conduct Regional EV/EVSE Readiness Conference

Appendix A – EV Readiness Definitions

Word	Acronym	Definition
Battery Electric Vehicle	*BEV*	Battery electric vehicles are all-electric, have no Internal Combustion Engine and are totally dependent on plugging into the electric power grid for fueling. *Range*: 80 to 300 miles on battery *Refuel*: 120V 8-12hours, 240V 3-6 hours, DC Fast Charge 80% in 30 minutes *Examples*: Nissan Leaf, Tesla Sedan, Coda, Ford Focus Electric, Mitsubishi I MiEV
CHAdeMO		Trade name of a quick charging method for battery electric vehicles via a special electrical connector. It is proposed as a global industry standard by an association of the same name.
Clean Cities Coalitions		Clean Cities Coalitions help fleets and consumers reduce their petroleum use. Clean Cities Coalitions builds partnerships with organizations in the public and private sectors to adopt: - Alternative and renewable fuels - Idle-reduction measures - Fuel economy improvements - New transportation technologies, as they emerge. *Tri-State Region Partners*: Alabama Clean Fuels Coalition, Clean Cities Atlanta, and Palmetto State Clean Fuels Coalition
Commercially Available EV		Electric vehicles which are currently available for purchase. For a list of available electric vehicles, please refer to goelectricdrive.com
Commercially Available EVSE		Electric vehicle charging stations which are currently available for purchase. For a list of available electric vehicles, please refer to pluginamerica.org/accessories
DC Charger		DC chargers, aka "DC Fast Chargers," are currently the fastest way to charge a battery. These chargers will only charge a battery up to 80% to protect the battery's life span and installation requires a qualified electrician. *Application*: Retail, Commercial, and On Street *Technical*: 480VOC, 100+ A *Charging time*: 80% charge in 30 minutes. *Connector*: CHAdeMO (SAE approval pending)

Word	Acronym	Definition
		Miscellaneous: Requires an electrical contractor for installation.
Electric Vehicle Supply Equipment	*EVSE*	Refers to charging stations for plug in electric vehicles.
EV Ready		Communities prepared to adopt EV technologies in order to reduce U.S. petroleum dependence and build the foundation for a clean transportation system.
Extended Range Electric Vehicles	*EREV*	EREVs are powered both by an internal combustion engine that can be fueled either by conventional or alternative fuels. The battery is charged by plugging the vehicle into an electric power source. EREVs are either parallel or series Hybrids and also known as PHEV
Hybrid Electric Vehicles	*HEV*	HEVs are powered both by an internal combustion engine as well as an electric motor. The energy for the electric motor is store in a battery which is charged through regenerative braking and by the Internal Combustion Engine (ICE). HEVs do not plug in to an electricity source to charge. All HEVs are parallel hybrids. *Range*: (300+ with gas motor) vehicle selects mechanical or electric power *Refuel*: Gas Station *Examples*: Toyota Prius, Ford Fusion, Toyota Camry, Honda Civic
Inductive Charging		Inductive charging does not require a plug-in connection. Electricity is transferred wirelessly. Inductive charging is not yet commercially available but will be soon. *Application*: Residential, Workplace, Commercial, and On Street Parking. *Technical*: 208/240 VAC, up to 80 A, but typically at around 40-60A *Charging time*: 4-8 hours *Connector*: Pad (there is no plug to connect to the vehicle) *Miscellaneous*: Should be available 2012 Q4

Word	Acronym	Definition
Internal Combustion Engine	*ICE*	Engines in which the combustion of fuel powers the drive train. ICE vehicles are usually fueled by petroleum or diesel, but may also use alternative fuels such as biodiesel, compressed natural gas, or ethanol. *Refuel*: Gas Station *Range*: 300+ miles
Level 1 Charging Station		Level 1 charging stations provide the slowest charge of available charging equipment. All homes are equipped to support Level 1 charging. *Application*: Residential and long term parking locations. *Technical*: 120V, 16A (dedicated circuit) *Charging time*: 8-22 hours *Connector*: SAE J1772 *Miscellaneous*: Typically uses the standard 3-prong plug (NEMA 5-15/20P)
Level 2 Charging Station		Level 2 charging stations provide a slightly faster charge than a Level 1 charger. Some homes may require electrical upgrades to support the 240V charging. This is an appropriate application for commercial and residential sites. *Application*: Residential, Workplace, Commercial, and On Street Parking. *Technical*: 208/240 VAC, up to 80 A, but typically at around 40-60A *Charging time*: 2-4 hours *Connector*: SAE J1772 *Miscellaneous*: Requires an electrical contractor for installation
Neighborhood Electric Vehicle	*NEV*	Vehicles powered by electricity stored in the battery. These vehicles have a speed limit of 30 miles per hour. In some jurisdictions, NEVs are street legal. Check with your state's DMV for operational procedures. *Range*: typically 30 miles or less. *Refuel*: 120V 8-12hours, 240V 3-6 hours, DC Fast Charge
Parallel Hybrid		Parallel hybrids simultaneously transmit power to the drive wheels from two distinct sources: an ICE and a battery-powered electric drive. *Examples*: Toyota Prius

Word	Acronym	Definition
Plug-In Electric Vehicle	*PEV*	A vehicle that uses electricity as a fuel. Includes hybrids and pure electric vehicles.
Plug-in Hybrid Electric Vehicle	*PHEV*	PHEVs are powered both by an internal combustion engine that can be fueled either by conventional or alternative fuels. The battery is charged by plugging the vehicle into an electric power source. PHEV can either be parallel or series Hybrids. *Refuel*: Gas Station and Electricity Source *Range*: 20-40 miles on battery; 300+ miles with gas backup. *Examples*: Chevy Volt, Fisker Karma, Plug-In Prius
Range		Distance a fully fueled vehicle will travel.
SAE		US-based organization for engineering professionals in the aerospace, automotive, and commercial vehicle industries. The Society coordinates the development of technical standards based on best practices identified and described by SAE committees and task forces comprising engineering professionals in the relevant fields. They have developed the American standard for electrical connectors for electric vehicles known as the J1772 connector
Series Hybrid		Series hybrids use an ICE to turn a generator that fuels an electric motor. Only the electric motor powers the wheels. *Examples*: Chevy Volt, Fisker Karma