# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEAD ORGANIZATIONS</td>
<td>1</td>
</tr>
<tr>
<td>PRIMARY INVESTIGATOR/AUTHOR</td>
<td>1</td>
</tr>
<tr>
<td>CONTRIBUTORS</td>
<td>1</td>
</tr>
<tr>
<td>GREATER CHARLOTTE REGION ELECTRIC VEHICLE ADVISORY COMMITTEE</td>
<td>1</td>
</tr>
<tr>
<td>MISSION STATEMENT</td>
<td>2</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>2</td>
</tr>
<tr>
<td>COMMON TERMS</td>
<td>3</td>
</tr>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>4</td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td>7</td>
</tr>
<tr>
<td>1.1 PURPOSE OF THE GREATER CHARLOTTE PEV READINESS PLAN</td>
<td>7</td>
</tr>
<tr>
<td>1.2 HISTORY OF PEV READINESS IN THE GREATER CHARLOTTE REGION</td>
<td>13</td>
</tr>
<tr>
<td>1.3 NC PEV READINESS INITIATIVE: PLUGGING IN FROM MOUNTAINS TO SEA</td>
<td>15</td>
</tr>
<tr>
<td>1.4 NORTH CAROLINA PEV TASKFORCE</td>
<td>16</td>
</tr>
<tr>
<td>1.5 HOW THE GREATER CHARLOTTE PEV READINESS PLAN IS TO BE USED</td>
<td>16</td>
</tr>
<tr>
<td>1.6 ORGANIZATION OF THIS PLAN</td>
<td>17</td>
</tr>
<tr>
<td>1.7 DEFINING THE PLAN’S BOUNDARIES</td>
<td>19</td>
</tr>
<tr>
<td>1.8 GOALS OF THE GREATER CHARLOTTE PEV READINESS PLAN</td>
<td>20</td>
</tr>
<tr>
<td>2 STAKEHOLDERS AND WORK AREAS</td>
<td>21</td>
</tr>
<tr>
<td>2.1 STEERING COMMITTEE AND STAKEHOLDERS</td>
<td>21</td>
</tr>
<tr>
<td>2.2 WORK AREAS</td>
<td>22</td>
</tr>
<tr>
<td>2.3 PUBLIC ENGAGEMENT FOR THE GREATER CHARLOTTE PEV READINESS PLAN</td>
<td>24</td>
</tr>
<tr>
<td>3 VEHICLES</td>
<td>31</td>
</tr>
<tr>
<td>3.1 INTRODUCTION TO PLUG-IN ELECTRIC VEHICLES WORK AREA</td>
<td>31</td>
</tr>
<tr>
<td>3.2 HISTORY OF PEVS IN THE GREATER CHARLOTTE REGION</td>
<td>31</td>
</tr>
<tr>
<td>3.3 NC PEV TASKFORCE: VEHICLES WORKING GROUP</td>
<td>33</td>
</tr>
<tr>
<td>3.4 TYPES OF PEVS</td>
<td>34</td>
</tr>
<tr>
<td>3.5 GREATER CHARLOTTE REGION: VEHICLES WORKING AREA</td>
<td>35</td>
</tr>
<tr>
<td>3.6 CURRENT VEHICLE ADOPTION</td>
<td>36</td>
</tr>
<tr>
<td>3.7 DEPLOYMENT ESTIMATES AND USAGE PATTERNS</td>
<td>41</td>
</tr>
<tr>
<td>3.8 RECOMMENDATIONS</td>
<td>43</td>
</tr>
<tr>
<td>4 INFRASTRUCTURE</td>
<td>44</td>
</tr>
<tr>
<td>4.1 INTRODUCTION TO INFRASTRUCTURE WORK AREA</td>
<td>44</td>
</tr>
<tr>
<td>4.2 NC PEV TASKFORCE: INFRASTRUCTURE WORKING GROUP</td>
<td>44</td>
</tr>
<tr>
<td>4.3 THE GREATER CHARLOTTE REGION’S BACKGROUND IN INFRASTRUCTURE</td>
<td>45</td>
</tr>
<tr>
<td>4.4 PEV CHARGING INFRASTRUCTURE</td>
<td>49</td>
</tr>
<tr>
<td>4.5 GREATER CHARLOTTE REGION: INFRASTRUCTURE AREA</td>
<td>53</td>
</tr>
<tr>
<td>4.6 CHARGING INFRASTRUCTURE PLANNING</td>
<td>54</td>
</tr>
<tr>
<td>4.7 RECOMMENDATIONS</td>
<td>57</td>
</tr>
</tbody>
</table>
Lead Organizations
Centralina Council of Governments
Centralina Clean Fuels Coalition

Primary Investigator/Author
Sean Flaherty, Centralina Council of Governments

Contributors
Cyrus Dastur, Advanced Energy
Katie Drye, Advanced Energy
Emily Parker, Centralina Clean Fuels Coalition
Jason Wager, Centralina Clean Fuels Coalition
Blair Israel, Centralina Council of Governments
Cindy Keene, Duke Energy Carolinas
Allison Billings, Innovative Urban Strategies
Mike Waters, Progress Energy Carolinas

Greater Charlotte Regional Electric Vehicle Advisory Committee
Advanced Energy
ATEC
AmpMobile Conversions
Bank of America
Cabarrus County
Calor Energy
Carolina Industrial Equipment
Charlotte Airport
Childress Klein Properties
City of Charlotte
Charlotte Chamber
City of Gastonia
Central Piedmont Community College
Charlotte Truck Center
CODA Automotive
Component Systems Inc.
Discovery Place
Duke Energy
East Charlotte Nissan
Enterprise Holdings
EDC Mooresville
Evatran
Gexpro
McKenney Salinas Honda
Mecklenburg County Building
Development Commission
Mecklenburg County
Permitting Department
Mooresville Chamber
Modern Nissan of Lake
Norman
NC Dept. of Commerce
NCSEA
Packard Place
Parks Automotive Group
Parks Chevrolet
Rockwood Lithium
Siemens
South Charlotte Nissan
Spotlight Solar
Steve Moore Chevrolet
SustainCharlotte
Town of Davidson
Town of Lincolnton
UNC Charlotte
WBTV-CBS
Wells Fargo
WESCO Distribution
MISSION STATEMENT
To provide a resource for the Greater Charlotte, N.C. region, in coordination with state-level planning efforts, to address the barriers to the adoption of plug-in electric vehicle (PEV) infrastructure as part of a broader sustainable transportation strategy by leveraging the collaboration of local public and private organizations.

ACKNOWLEDGMENT
This material is based upon work supported by the Department of Energy under Award Number DE-EE0005583.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

The NC PEV Readiness Initiative: Plugging in from Mountains to Sea (M2S) planning project with funding provided by the U.S. Department of Energy’s Clean Cities Program through Centralina Council of Governments. Project collaborators include: Advanced Energy, Land-of-Sky Regional Council, NC Solar Center/NC State University, Piedmont Triad Regional Council, & Triangle J Council of Governments.

TEMPLATES AND PROCESSES FOR COMMUNITY PLAN
The templates for the Community Planning process were provided through previously developed tools from the North Carolina Get Ready program administered by Advanced Energy. Funding from the U.S. Department of Energy for the North Carolina PEV Readiness Initiative: Plugging in from Mountains to Sea (M2S) was used to customize the tools including the Community Planning Matrix, the PEV Initiative Paper and other documents for the Community PEV Readiness Plans. All planning tools used during the development of the Community Plan are included in the appendix of this document.
### COMMON TERMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADA</td>
<td>Americans with Disabilities Act</td>
</tr>
<tr>
<td>CCFC</td>
<td>Centralina Clean Fuels Coalition</td>
</tr>
<tr>
<td>COG</td>
<td>Council of Government</td>
</tr>
<tr>
<td>CCOG</td>
<td>Centralina Council of Governments</td>
</tr>
<tr>
<td>CPM</td>
<td>Community Planning Matrix</td>
</tr>
<tr>
<td>DOE</td>
<td>US Department of Energy</td>
</tr>
<tr>
<td>EPRI</td>
<td>Electric Power Research Institute</td>
</tr>
<tr>
<td>EVSE</td>
<td>Electric Vehicle Supply Equipment, commonly referred to as Charging Station</td>
</tr>
<tr>
<td>ICE</td>
<td>Internal Combustion Engine</td>
</tr>
<tr>
<td>kWh</td>
<td>Kilowatt Hour</td>
</tr>
<tr>
<td>MPO</td>
<td>Metropolitan Planning Organization</td>
</tr>
<tr>
<td>NCDOT</td>
<td>North Carolina Department of Transportation</td>
</tr>
<tr>
<td>NCDMV</td>
<td>North Carolina Division of Motor Vehicles</td>
</tr>
<tr>
<td>NCSEO</td>
<td>North Carolina State Energy Office</td>
</tr>
<tr>
<td>NCSU</td>
<td>North Carolina State University</td>
</tr>
<tr>
<td>NEC</td>
<td>National Electric Code</td>
</tr>
<tr>
<td>PEV</td>
<td>Plug-in Electric Vehicle</td>
</tr>
<tr>
<td>REVAC</td>
<td>Regional Electric Vehicle Advisory Committee</td>
</tr>
<tr>
<td>RPO</td>
<td>Rural Planning Organization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charging Station</td>
<td>Device that transfers power to a PEV while providing proper grounding, shock protection, overload protection and general communication.⁴</td>
</tr>
<tr>
<td>Electric Vehicle Supply Equipment (EVSE)</td>
<td>The official term for electric vehicle charging infrastructure, more commonly referred to as charging stations.</td>
</tr>
<tr>
<td>Internal Combustion Engines</td>
<td>Engines that generate mechanical power by burning a liquid fuel (such as gasoline, diesel, or biofuels) or a gaseous fuel (such as a compressed natural gas). They are the dominant engines used in on-road vehicles today.⁴</td>
</tr>
<tr>
<td>Plug-in electric vehicles</td>
<td>Derive all or part of their power from electricity supplied by the electric grid. Common examples include the Chevrolet Volt and Nissan LEAF.</td>
</tr>
</tbody>
</table>

⁴ “Charging Station Installation Handbook”, Advanced Energy  
⁵ “Clean Cities Plug-In Electric Vehicle Handbook for Electrical Contractors”, U.S. DOE
EXECUTIVE SUMMARY

As communities across the United States make the move toward electrified transportation, opportunities are emerging for the greater Charlotte area business, government and community leaders to get involved, serve as champions and benefit from this movement.

Electric vehicle technology has rapidly advanced to offer new levels of environmental and energy savings and economic impact with the advent of the newest plug-in electric vehicles (PEVs).

To prepare for the introduction of PEVs in the United States in 2011 and beyond, communities across the country are evaluating their needs and assessing their resources to ready themselves for the wide variety of changes that these PEVs will require.

The analysis and recommendations presented in this document are intended to build upon the advantage PEVs provide for the greater Charlotte region and position this community as a leading market for the rollout and adoption of this transportation option.

Key Findings

Vehicles and Incentives
- High initial cost of ownership is a large barrier to PEV adoption for car buyers that are well informed about PEVs
- PEVs, and BEVs in particular, often have a lower total cost of ownership than similar gas vehicle for car buyers that own a car for 5 or more years
- North Carolina is one of the few states in the Southeast that does not provide a financial incentive to PEV buyers

Charging Infrastructure
- Over 62 charging stations have already been installed in the Greater Charlotte Region as of October 2012.
- It is projected that the demand for public charging could reach 870 stations by 2020 and over 7,250 stations by 2030.
- The perception of insufficient charging infrastructure among car buyers may be a larger barrier to PEV adoption than the actual lack of infrastructure

Policies, Codes & Standards
- Expedited permitting is essential to supporting the growing number of plug-in electric vehicle charging stations in the greater Charlotte region. Mecklenburg County’s Trade Internet Permitting (TIP) System is an excellent model for providing contractors with permits that can be obtained in an average of twenty minutes. These permits can be flagged specifically as EVSE to track anticipated impact on the power grid.
**Education & Outreach**
- Understanding of PEVs, their benefits, and local PEV readiness activities is limited among most car buyers and even some PEV dealers in the region
- Many car buyers have concerns or misconceptions about PEV emissions and batteries

**Utilities**
- Well-to-wheel emissions from a PEV that is powered solely by electricity in the Greater Charlotte region can be up to 50% lower than the emissions from a conventional gas vehicle and roughly 25% lower than the emissions from a hybrid electric vehicle

**Key Recommendations**

Recommendations were created for each of the focus areas of this plan including, vehicles, infrastructure, policy, codes and standards, education and outreach and incentives. A full list of recommendations for implementation is located at the end of this plan, however some of the key recommendations are listed below:

**Vehicles**
- Communicate the benefits and total cost of ownership of PEVs to public and private fleet managers.
- Provide authoritative third party information about PEVs to dealerships to help them respond to prospective PEV driver concerns.

**Infrastructure**
- Develop or identify business models for localities to recoup charging station costs (i.e., the cost of providing electricity).
- Create an ongoing Greater Charlotte Regional EVSE coordinating council that can continually revise/update EVSE locations and forecasts.

**Policies, Codes and Standards**
- Work with Local Governments to educate and encourage updating local codes by presenting at industry events, workshops and conferences.

**Education and Outreach**
- Work with local schools to incorporate PEV considerations into their curriculum through initiatives such as STEM Programs.
- Work with local community colleges, universities, and other workforce training centers.

**Incentives**
- Encourage local partners to develop monetary and non-monetary incentives (Chambers of Commerce, retail businesses, etc).
- Work through dealerships and other local partners to communicate available incentives using local media and social media.
1 INTRODUCTION
This plan is intended to serve as the Plug-In Electric Vehicle (PEV) Readiness Plan for the Greater Charlotte Region of North Carolina.

1.1 Purpose of the Greater Charlotte PEV Readiness Plan
The Greater Charlotte Region is home to the world headquarters of ten Fortune 500 companies, and since 1990, new and expanding businesses have invested more than $18 billion here, creating more than 170,000 new jobs. A number of academic, business and government entities across the region have been recognized nationally for their Plug-in Electric Vehicle (PEV) readiness efforts. This plan highlights these existing efforts and provides recommendations for readiness actions to further the adoption of PEVs and charging infrastructure in the community.

An Overview of the Greater Charlotte Region
The Centralina Council of Governments (CCOG) and the Centralina Clean Fuels Coalition (CCFC) serve the nine-county region in and around Charlotte. These counties include Anson, Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Stanly, and Union (See Figure 1). CCOG is one of seventeen state-designated councils of government, home to the state’s largest city and the nearly 25 percent of the population in North Carolina. CCOG supports the 9-county greater Charlotte region by helping to control the cost of government, grow the economy, and improve quality of life within its local member governments.

Located in the Central Piedmont of North Carolina, the Greater Charlotte area encompasses 74 municipalities representing almost two million people with the City of Charlotte at its core. That number is projected to grow to at least 3.5 million people 20 years from now. The region has been one of the most dynamic in the Southeast. Growth is spiraling outward from the City of Charlotte into surrounding counties following the completion of interchanges on I-485 as well as an extensive public utility infrastructure network.

Figure 1: Centralina COG nine-county region.
**Need for the Greater Charlotte PEV Regional Readiness Plan**

The transportation sector is established as a leading segment of our nation’s GDP, is fueled *almost* solely by imported petroleum, and ripe for change. The greater Charlotte region earned its' reputation for business leadership and innovation by challenging established models and segments. Challenging and perhaps revolutionizing the transportation and energy supply sector represents phenomenal future economic development opportunities. Research, manufacturing, and PEV supporting services are among the visions of opportunity as we enter the age of PEVs.

Almost every major vehicle manufacturer has announced their plans to add a PEV to their product line and several new start-up companies have entered the auto industry with the express purpose of producing PEVs. The global movement to embrace PEVs and related technologies is continuing to excel.

The United States government believes the manufacture and support of PEVs represent key components of future American economic growth, international competitiveness, national security and environmental health. As a result, the U.S. has invested millions of dollars of federal funding to accelerate battery development, vehicle manufacturing and infrastructure planning and infrastructure deployment.

**Plug-in Electric Vehicles are Coming to the Greater Charlotte Region**

According to current projections from the Electric Power Research Institute (EPRI), the 9-county greater Charlotte or Centralina region is expected to have 15,000 PEVs in service by the end of 2020 and more than 125,000 such vehicles on its roads by 2030, making it a necessity for local municipalities within the region to be prepared for these new technologies and associated infrastructure.³

EPRI’s market projections appear to be higher than what would be expected by simply scaling the national goal to the local population. This is due to several key factors. First, data from the N.C. Department of Motor Vehicles indicates a high density of local hybrid vehicle ownership, a leading indicator for consumer interest in PEVs which is reflected in manufacturer market surveys. The greater Charlotte PEV market also benefits from having:

- A leading business community
- Local electric utilities and electric cooperatives which are highly engaged with the PEV industry; and
- Proactive municipal local governments that are supported by multiple local technical advisors.

---

³ EPRI, *NC PEV and EVSE Penetration Estimate*, 2012
PEV Readiness Important to the Charlotte region

As one of the nation’s fastest growing regions, the arrival of the new PEVs will impact citizens, academic institutions, the business community and the government / public sector in a variety of ways. By becoming PEV ready, our community can stimulate local economies, take advantage of incentives for vehicles and infrastructure, enhance energy security by reducing dependence on foreign sources of petroleum, improve public health, and integrate PEVs into alternative and multi-modal transportation corridors.

The important advantages associated with these goals are not new to the Greater Charlotte Region. A number of individuals and organizations that call the 9-county county region home have been working towards improving the community for decades and in this same fashion, participated in the process that created a majority of information within this readiness plan.

Serving as the primary facilitator of information, the Centralina Clean Fuels Coalition (CCFC) has been in existence in the Greater Charlotte Region for over 10 years. The coalition was designated in April of 2004 in the Department of Energy’s Clean Cities program. Housed at the Centralina Council of Governments, CCFC serves the entire 9-county Greater Charlotte Region.

In 2010, Centralina Clean Fuels Coalition engaged research and analysis assistance from Innovative Urban Strategies (IUS), a Charlotte-based transportation and urban planning firm with a focus on researching, developing and evaluating programs, policies and initiatives that improve the livability of American cities. With special expertise in alternative modes of transportation and alternative fuels, IUS began working in November 2010 to assist CCFC to ready the region for the deployment of PEVs as a local transportation option by developing a PEV Action Plan and Communications Strategy. The PEV Action Plan and Communications Strategy identified a number of issues that highlight the importance of PEV readiness in the Greater Charlotte Region:

• Rapidly advancing plug-in electric vehicle technology

Manufacturers of batteries and charging stations continue to improve and enhance the technologies. Already, lithium-ion batteries used in PEVs have more capacity at fractions of the weight and costs as prior models. Charging technology is advancing, bringing more rapid-charging capability that will especially benefit fleets and public charging stations. With private and public-sector research and product development, multiple efforts across the country are bringing the forefront of PEV technology to the market, expanding opportunities vehicle owners, businesses and local governments for vehicles and charging options.

The Electric Power Research Institute (EPRI) estimates that there will be more than 125,000 plug-in electric vehicles in the greater 9-county Charlotte region by the year 2030.
• **Focus on renewable energy technologies by federal, state and local governments**

The federal administration has already made a $2.4 billion investment in the development of electric vehicle batteries and other electric drive technology, provides tax incentives for conversions, charging stations and car purchases. Twenty-two states are offering incentives of some sort for adoption and implementation of PEV and EV technologies. The federal government has set a goal of being the first nation to have one million electric cars on the roads by 2015. Multiple programs have been and continue to be underway to promote the deployment of alternative fuel vehicles around the country. These initiatives are led primarily by the US DOE Clean Cities program and in locally by the CCFC.

• **Emphasis on reducing dependence on foreign oil**

Leaders in government and business continue to look for ways to reduce America’s dependence on foreign oil for both energy and economic security. A rising urgency to move toward energy security is revealed as over half of the oil used currently is imported. Since American’s still nearly exclusively rely on oil to power our transportation lifestyles, without viable options for transportation particularly, such as mainstream PEV technologies, this dependence will continue to rise.

• **Improving air quality**

Eight counties in the greater Charlotte region are designated by the US EPA as being in nonattainment for ground-level ozone: Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, and Union (as well as York, SC), which means that pollution is exceeding healthy levels. Since an estimated 55% of the ozone air pollution in these regions is emissions from mobile sources (i.e., vehicles), the more widespread adoption of PEV technologies sets the stage for air quality improvements in the greater Charlotte region.

• **Environmental concerns about climate change**

Reducing greenhouse gas emissions continues to be an important strategy in the concern about global warming. Fossil-fuel based vehicles driven in America account for over 1.7 billion tons of CO₂ into the atmosphere each year, with about 6 to 9 tons of CO₂ per year for a typical vehicle. Replacing gasoline-powered vehicles with minimal-polluting PEVs is a key strategy to move toward a lower-carbon future.

• **Car manufacturers moving forward with new vehicles**

Soon there will be a PEV model for every taste and budget of driver. The PEVs currently available range from the high-end/high-performance Tesla Roadster to the more consumer accessible Nissan Leaf and Chevy Volt. Electric vehicles will continue arriving into the market as countries around the globe also set electric drive transportation goals and face their own oil price and availability challenges.
• **Energy-centered manufacturing opportunities**

More and more communities are developing opportunities to promote and develop green energy businesses. With increased pressure and desire for energy efficient, clean-sourced business, the push for sustainable commercialization of PEVs will bring more local and regional economic opportunities. These may include automotive and other equipment manufacturers, energy companies who are looking into grid sustainability and power delivery enhancements, charging technology developers, a variety of component and battery suppliers, and others.

• **Desire for cost savings**

With the rising cost of gasoline (and diesel) taking a bigger bite out of household, corporate and public sector budgets, PEVs may offer a viable alternative to the cost of driving. Running a vehicle on electricity is one-third to one-quarter less than the cost of running a vehicle on gasoline. Filling up your car at even just $3.00/gallon yields an average cost of 10 cents/mile or more compared to about 2.5 cents/mile for cars charged at average electricity prices. This yields substantial savings for car owners and fleet managers alike.

*The Benefit of Community Wide Planning*

A focus on inclusivity among a variety of stakeholders is essential to maximizing a community’s ability to meet its local planning needs while supporting residents and the PEV market. Recognizing the benefits of community wide planning, the Greater Charlotte area’s Regional Electric Vehicle Advisory Committee (REVAC) was established by Centralina Clean Fuels Coalition in fall 2009 and represented the first time that stakeholders in the region gathered to discuss PEV readiness at a community wide level.

As part of the community planning effort, stakeholders identified a need to develop principals to prioritize next steps for regional PEV readiness, communication and other preparedness initiatives to guide PEV readiness efforts across the greater Charlotte region. Responses were gathered during an interactive discussion and prioritization exercise at the December 16, 2010 Regional Electric Vehicle Advisory Committee (REVAC) meeting. In addition to the meeting, questions were posed to stakeholders through an online questionnaire in attempt to prioritize items to be included within an Action Plan and Communications Strategy. The complete Centralina Clean Fuels Coalition (CCFC) Action Plan and Communications Strategy can be found within Appendix D and E, respectfully.

*Figure 2: PEV Charging Station located at 567 Mocksville Hwy Statesville, NC 28625*
Based on the input obtained at the December 2010 REVAC meeting, combined with responses received from the online questionnaire, three (3) Guiding Concepts for community PEV readiness were developed to help establish the Greater Charlotte region’s priorities moving forward. As reviewed and approved by REVAC, these guiding concepts are:

1) **Educate** potential consumers and regional stakeholders about the features and benefits of PEVs in order to ensure a positive customer experience.

2) **Prepare** the greater Charlotte region as a clean energy and advanced technology leader working towards energy independence by utilizing PEVS.

3) **Collaborate** with regional PEV stakeholders to develop and/or support purchase and ownership incentives for PEVs and the supporting public and private infrastructure.

To evaluate the greater Charlotte region’s readiness for the anticipated PEV roll-out from multiple vehicle manufacturers, a matrix-based PEV readiness evaluation tool was developed and completed.

The matrix includes the following:

**Categories**
Based on a review of national and regional efforts, eight main categories of PEV readiness were identified where efforts should be addressed, including the following: *(not prioritized)*

1. First responder & safety
2. Monitoring & evaluation of ongoing PEV readiness efforts
3. Planning & financing for PEVs and charging infrastructure
4. Public charging
5. Policies (permitting processes, incentives, zoning requirements)
6. Public information & outreach
7. Stakeholder coordination
8. Workforce development

**Phases**
In addition, the review of the eight categories above is offered in a matrix according to the following:

1. Existing conditions  
2. Current needs  
3. Action steps
1.2 History of PEV Readiness in the Greater Charlotte Region

Organizing PEV education, outreach and funding administration has been led locally by the Centralina Clean Fuels Coalition, with a broad range of regional stakeholders. Over the past three years, the greater Charlotte region has seen a number of readiness actions and activities, including the following:

- **Fall 2009:** CCFC formed the Electric Vehicle (EV) Subcommittee of key EV industry partners and stakeholders. This group has guided much of the CCFC’s EV efforts since.

- **Spring 2010:** CCFC staff sat on the review committee for Clean Fuel Advanced Technology (CFAT) program, reviewing several EV/EVSE-related proposals that were ultimately awarded funding.

- **Engaged Mecklenburg County Code Officials and Duke Energy in the development of a targeted event around EVs and code officials. Identified Mecklenburg County automated permitting process as unique and among the most streamlined in the country relative to EV charging installation at residential locations.**

- **May 2010:** Began administration of Carolina Blue Skies and Green Jobs Initiative, an ARRA-funded Clean Cities award to a NC/SC bi-state partnership. Over $2 million has been awarded to projects in the greater Charlotte region that CCFC oversees – including advanced technology, hybrid electric projects with Duke Energy and the Charlotte Douglas International Airport – valued at a combined total of $1.8 million.


- **July 22, 2010:** Traveled to Washington, DC and represented the Greater Charlotte Region among other leading “EV ready” metropolitan areas across the country at the US Department of Energy’s Plug-in Vehicle and Infrastructure Workshop.

- **Fall 2010:** CCFC funded the installation of five (5) Level II public charging stations in the City of Gastonia at the Downtown Gastonia Convention Center and the Schiele Museum. City of Gastonia followed this award up with application for funds to purchase ten (10) Nissan Leaf vehicles through local Congestion Mitigation and Air Quality (CMAQ) grant dollars.

- **Partnered in additional projects to implement public charging stations in Charlotte (through EECBG grant with match provided by corporate partners) and parts of South Carolina (e.g., Rock Hill) through partnership with the Palmetto State Clean Cities Coalition.**

- **Fall/Winter 2010:** Conducted an online poll of stakeholders about perceptions of PEV readiness in the greater Charlotte region (questionnaire results included in Appendix D).
• December 16, 2010: CCFC convened the Regional EV Advisory Committee (REVAC), comprised of key public and private sector EV stakeholders from the greater Charlotte region, at CCOG offices. (Membership list included in Action Plan Appendix D).

• December 2010: PEV charging stations installed at two Bank of America-owned surface parking lots in center city Charlotte as well as at Mint Street Parking Deck

• February 2011: The Greater Charlotte Region Plug-in Electric Vehicle Readiness Action Plan is complete, as well as the Greater Charlotte Region PEV Communications Strategy.

• February 2011: Ritz Carlton installs ChargePoint plug-in charging station in their parking deck

• March 2011: Developed www.Go4PEV.org website content and design to serve as a resource for PEV readiness in the greater Charlotte area.

• March 17, 2011: The “Green Day” media event at the Schiele Museum in Gastonia, North Carolina was held to publicly announce the first PEV charging station in Gaston County.

• June 14, 2011: CCFC was the lead applicant in the NC PEV Readiness Initiative: Plugging in from Mountains to Sea proposal in response to the Clean Cities Community Readiness and Planning for Plug-in Electric Vehicles and Charging Infrastructure funding opportunity worth $500,000.

• Fall 2011: CCFC is awarded $500,000 from the Clean Cities Community Readiness and Planning for Plug-in Electric Vehicles and Charging Infrastructure funding opportunity.

• October 2011: The NC PEV Taskforce hosts the official kickoff meeting for North Carolina’s initiative to plan and prepare for the success of plug-in electric vehicles at North Carolina State University in Raleigh, NC.


• April 12, 2012: CCFC kicks off PEV planning work for the Greater Charlotte Region by reconvening the Regional Electric Vehicle Advisory Committee (REVAC) at Discovery Place in Uptown Charlotte.

• May 24, 2012: REVAC meets at the Gastonia Conference Center in the City of Gastonia to focus on Infrastructure and Vehicle considerations for PEV readiness planning in the region.

• June 28, 2012: REVAC meets at the Cabarrus County Government Center in City of Concord to focus on Economic Development and Incentives for PEV readiness planning in the region.

• August 9, 2012: REVAC meets at Davidson Town Hall in the Town of Davidson to review the Policy, Codes & Standards and Education & Outreach working areas for PEV readiness planning.

• October 12, 2012: REVAC convenes for the final time to review PEV readiness planning and make final recommendations before CCFC staff begin authoring the Greater Charlotte PEV Readiness Plan.
1.3 NC PEV Readiness Initiative: Plugging In from Mountains to Sea

The Greater Charlotte PEV Readiness Plan was developed under the NC PEV Readiness Initiative “Plugging-in from Mountains to Sea” (M2S) funded through the US DOE. The plan is intended to be both publicly available and replicable. The M2S project is one of 16 electric vehicle community readiness planning initiatives awarded by the U.S. DOE in an effort to increase awareness and actual consumer usage, as well as to help communities develop plans for the infrastructure needed to support the expected influx of PEVs. The M2S project includes multiple initiatives consisting of the development of a state-wide PEV readiness plan (through the NC PEV Taskforce) and four local PEV readiness plans for Asheville, Charlotte, the Piedmont Triad and the Triangle. This document serves as the community readiness plan for the Greater Charlotte Region.

Figure 3: The Mountains to Sea (M2S) Project funded PEV readiness planning efforts in 33 counties across North Carolina. Community planning work occurred in four regions across the state.

These PEV readiness plans will serve as a guide to strengthen existing local and state initiatives in an effort to help North Carolina communities address their specific needs, including:

- Updating permitting processes;
- Revising codes;
- Training appropriate personnel;
- Assessing infrastructure needs;
- Promoting public awareness; and
- Evaluating and developing incentives.

Funding for the M2S project was provided by the U.S. Department of Energy’s Clean Cities Program through Centralina Council of Governments. Project collaborators included: Advanced Energy, Land-of-Sky Regional Council, NC Solar Center/NC State University, Piedmont Triad Regional Council, & Triangle J Council of Governments.
1.4 North Carolina PEV Taskforce

The NC PEV Taskforce is an initiative of the North Carolina Department of Commerce and Advanced Energy. The Taskforce was formed in spring of 2011 and held its kick-off meeting in the fall of 2011. Stakeholders include local, regional, and state government entities, PEV industries, electric utilities, academia, non-profits, local chambers of commerce and more. Additional information on the NC PEV Taskforce can be found within the North Carolina PEV Roadmap available at www.ncpevtaskforce.org.

How does the State Roadmap work with the Greater Charlotte PEV Readiness Plan?

The NC PEV Taskforce received an infusion of funding through U.S. Department of Energy Grant assistance in the form of the NC PEV Readiness Initiative: Plugging In from Mountains to Sea. The grant allowed for the taskforce to create a statewide PEV Roadmap (readiness plan) for North Carolina. The state roadmap was created in conjunction with this plan for the Greater Charlotte Region and the three other plans in the greater Asheville, Piedmont Triad and Research Triangle areas of the state. The Greater Charlotte PEV Readiness Plan will contain multiple references to the statewide PEV Roadmap for specific information relative to PEV readiness issues that pertain to all communities within North Carolina.

1.5 How the Greater Charlotte PEV Readiness Plan is to be Used

This document was created at the community level and applies to the nine county region represented by Centralina Council of Governments. Local counties and municipalities are encouraged to support this plan by passing a resolution of support. A draft resolution can be found in Appendix F.
**Vision, Policy, Implementation**

The Greater Charlotte PEV Readiness Plan is intended to be publicly releasable and replicable. Local government leaders are encouraged to support PEV readiness through the following actions:

- Adopt the vision of the plan in the local community: Local governments within the 9-county region are encouraged to pass resolutions of support for this PEV readiness plan.
- Develop local policies in support of PEV readiness: Local governments are encouraged to review the recommendations of this plan and update local policies and ordinances to allow for increased adoption of electric vehicles and deployment of charging infrastructure.
- Implementing electric vehicle recommendations in the local jurisdictions: In order to have the maximum level of effectiveness, it is recommended that local government and associated organizations review and implement, when possible, the recommendations of the plan and report actions of implementation to Centralina Council of Governments for monitoring purposes.

**1.6 Organization of this Plan**

The Greater Charlotte PEV Readiness plan incorporates all elements recommended by the U.S. Department of Energy for PEV planning in addition to elements specific to the Greater Charlotte Region. Each section of this plan addresses a specific element of PEV readiness.

**Sections of the Plan**

The Community PEV Readiness Planning process involved engaging local stakeholders to explore six different work areas associated with preparing for plug-in electric vehicle adoption:

- **Vehicles** - Chapter 3
- **Infrastructure** - Chapter 4
- **Policy, Codes and Standards** - Chapter 5
- **Education and Outreach** - Chapter 6
- **Economic Development** - Chapter 7
- **Incentives** - Chapter 8
- **Utilities** - Chapter 9
- **Implementation** - Chapter 10

**Community Planning Matrix**

Centralina Council of Governments used the Community Planning Matrix to navigate through the readiness planning process. The Community Planning Matrix is a spreadsheet originally developed by Advanced Energy for the PEV planning process and customized through the Mountains to Sea PEV readiness planning process.

The community planning matrix was used to identify tasks and track completion for the community planning matrix. The items were prioritized and tasks that were designated lower priorities, or that were unable to be completed during the planning phase, were noted to be evaluated for ways to address barriers during the implementation phase of this plan.
Description of Work Areas for the Greater Charlotte PEV Readiness Plan

- **Vehicles:** The Vehicles work area addressed goals related to increasing the number of PEVs in operation. Stakeholders interested in this area explored questions about the suitability and cost-benefit comparison of PEV use versus the use of conventional ICE or hybrid vehicles.

- **Infrastructure:** While research shows that PEV owners will do the vast majority of their vehicle charging at home, the availability of workplace and public charging stations is expected to have a significant impact on market adoption of PEVs. In all cases, selecting the proper features, locations, communications with and ownership of PEV charging stations is important and must be addressed. The primary focus of the stakeholders engaged in the infrastructure work area was to define a plan for deploying residential, workplace, private, and publicly available charging infrastructure in the community.

- **Education and Outreach:** The Education and Outreach work area will explore the identification of existing or needed resources for electric vehicle knowledge, and developed a plan for disseminating that knowledge to appropriate partners and the public through outreach, training, and marketing.

- **Policy, Codes and Standards:** The policies, codes and standards of stakeholders such as municipal planning and inspection departments, electrical contractors, electric utilities, and businesses have a large impact on a community’s successful adoption of PEVs.

- **Incentives:** Utilizing incentives is an important way to support the level of early adoption necessary to make PEVs a common consumer choice. The Incentives work area covered efforts to define and evaluate various benefits that could be provided to encourage community members to become PEV owners or drivers.

- **Economic Development:** Ensuring that PEVs are branded as a means for economic development opportunities and job creation can help reach pockets of the community less focused on PEV’s more well-known benefits of lower fuel costs and reduced emissions.
1.7 Defining the Plan’s Boundaries

The Greater Charlotte PEV Readiness Plan’s boundary for electric vehicle readiness largely depended on where vehicles in the community will travel on a daily basis. Most all-electric vehicles do not currently have the range to travel long distances and are better suited for the daily travel patterns of the average commuter. In order to understand the travel patterns, a survey was conducted with the regional transportation planners that work with area Metropolitan Planning Organizations (MPOs) staff. There are three MPOs located within the greater Charlotte region; the Cabarrus-Rowan MPO, the Gaston MPO and the Mecklenburg-Union MPO. The region also includes two Rural Planning Organizations (RPOs); the Lake Norman RPO and Rocky RPO.

**PEV Planning Boundary Survey**

Partners in the M2S project created a “PEV Planning Boundary Survey” to standardize interviews with staff representatives from the MPOs and RPOs in the greater Charlotte region. The M2S project partners determined that defining PEV planning boundaries based on pre-established criteria such as data used by the MPOs / RPOs in each community (traffic pattern data, work place densities, and other considerations) would assist with the justification of the planning jurisdictions. Additionally, by involving local MPOs / RPOs as stakeholders early in the PEV readiness planning process, local transportation planners were able to begin correlate long-range transportation planning efforts with issues specific to PEVs and charging infrastructure. The PEV Planning Boundary Survey can be found within Appendix A.

**Steps for Defining the Planning Boundary Survey**

As a result of the “PEV Planning Boundary Survey”, it was determined that the geographic boundaries for PEV readiness planning should mimic that of Centralina Council of Governments 9-county region while taking into account expected changes to the currently defined urban area boundaries.
1.8 Goals of the Greater Charlotte PEV Readiness Plan

The Goals of the Greater Charlotte Community PEV Readiness Plan were developed using input from the Regional Electric Vehicle Advisory Committee (REVAC) and guidance from the U.S. Department of Energy.

**Goal 1**
Continue to support the guiding principles for PEV readiness established in 2010 by the Regional Electric Vehicle Advisory Committee (REVAC):

- **Educate** potential consumers and regional stakeholders about the features and benefits of PEVs in order to ensure a positive customer experience.
- **Prepare** the greater Charlotte region as a clean energy and advanced technology leader working towards energy independence by utilizing PEVS.
- **Collaborate** with regional PEV stakeholders to develop and/or support purchase and ownership incentives for PEVs and the supporting public and private infrastructure.

**Goal 2**
Identify and distribute local municipal best practices in permitting and installation of plug-in vehicle charging stations that address concerns around optimal charging location decisions, built environment impacts on charging behavior, and installations at multi-family dwelling units.

**Goal 3**
Promote open information exchange with charging providers as well as training opportunities for the PEV workforce by working with existing programs, employment centers, and community colleges.

**Goal 4**
Identify and address the unintended consequences of promoting and incentivizing PEVs at the expense of other traditional and alternative transportation options.

**Goal 5**
Explore ways to sustain the momentum created through this planning collaboration beyond current activities by engaging regional political leaders to work towards plan endorsement and adoption.
2 STAKEHOLDERS AND WORK AREAS
As PEVs continually become more available to North Carolina consumers, and charging stations appear in greater numbers across the state, the opportunity to generate PEV related economic development also increases. In order to fully take advantage of these opportunities, North Carolina must work to continue to be a leader in PEV readiness throughout the country. This vision will require coordination among a wide range of stakeholders throughout the state to become reality.

2.1 Steering Committee and Stakeholders

Regional Electric Vehicle Advisory Committee (REVAC)
In 2009 the Centralina Clean Fuels Coalition formed the Electric Vehicle (EV) Subcommittee made up of key EV industry partners and stakeholders in the greater Charlotte region. This group was expanded in 2010 when stakeholders recognized a growing need to focus on plug-in electric vehicles and charging infrastructure. Designated the Regional Electric Vehicle Advisory Committee (REVAC), the formalized committee engaged a number of key entities in addition to previous membership including:

- Corporate Business
- Economic Development Organizations
- Fleet Managers
- Local Planners
- Municipal Code Officials
- National Initiatives
- Non-Profits
- Regional Transportation Organizations
- State Air Quality Protection
- Sustainability Professionals
- Universities and Community Colleges
- Utilities

Membership continued to grow in 2011 and 2012 allowing REVAC to coordinate a number of activities working towards PEV readiness until organizing its focus solely on the creation of the Greater Charlotte PEV Readiness Plan.

Local Champions
Members of the Regional Electric Vehicle Advisory Committee (REVAC) appointed local champions to represent the six working areas within the Greater Charlotte PEV Readiness Planning effort. These individuals worked directly with staff at Centralina Clean Fuels Coalition (CCFC) and coordinated local planning efforts with leadership at the statewide planning level through the NC PEV Taskforce. This multi-lateral approach to PEV readiness planning in the community allowed issues being discussed at the state level to be refined and customized to better fit the needs of the Greater Charlotte Region.
2.2 Work Areas

In order to ensure that all relevant stakeholders were identified and given the opportunity to participate in the Greater Charlotte PEV readiness plan, six categories were identified. After identifying these categories, members of the Regional Electric Vehicle Advisory Committee (REVAC) began to designate local champions to serve as content experts for each respective category.

Stakeholders who were identified and invited to serve as local champions for each PEV readiness category had a number of duties and responsibilities. Their main responsibilities included attending monthly REVAC meetings, participating in the discussion, co-presenting as local content experts during REVAC meetings that focused on their working area, completing small tasks in-between meetings, and possibly serving on voluntary subcommittees.

The Regional Electric Vehicle Advisory Committee (REVAC) used the Community Planning Matrix and content collected through the leadership of local champions plus additional technical content experts to address the six work areas for the development of the Community Readiness Plan.

The following organizations were represented by REVAC stakeholders in their work as local champions representing the six working areas within the Greater Charlotte PEV Readiness Planning effort:

**VEHICLES**
Mr. Brian Bostic – Enterprise Holdings
Mr. Stan Hinson – Modern Nissan of Lake Norman

**INFRASTRUCTURE**
Ms. Jamie Bond – Duke Energy

**EDUCATION & OUTREACH**
Dr. Robert Corbin – Discovery Place
Mr. Douglas Coler – Discovery Place

**POLICY, CODES & STANDARDS**
Mr. Joseph Weathers - Mecklenburg County Code Enforcement

**INCENTIVES & ECONOMIC DEVELOPMENT**
Mr. Michael Manis – Centralina Community & Economic Development
Ms. Kristy Crisp – City of Gastonia
In addition to the leadership provided by Local Champions, content experts were invited to individual meetings of the Regional Electric Vehicle Advisory Committee to assist and share their knowledge to help identify strategies and recommendations for the plan. For a full description of the work completed in each work area and members that attended the meeting, please visit the chapter associated with the work area.

Monthly REVAC meetings were organized to discuss in detail the six working group categories described in section 2.2 of this plan. After a preliminary meeting meant to introduce REVAC members to the tasks associated with community PEV readiness planning, pairs of working group topics were designated to monthly stakeholder meetings. REVAC members worked in facilitated sessions during each of the monthly meetings and collaborated topically with guidance provided by CCFC staff, local champions and NC PEV Taskforce state working group leads. Meeting agendas for 2012 REVAC Meetings are within Appendix B.

### Figure 6: The Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) began focusing solely on PEV readiness planning in April 2012 with a kick-off meeting at Discovery Place Museum in the City of Charlotte. Pairs of working areas were designated the focus of monthly meetings as planning work continued and were each held in different municipalities across the 9-county region. Community planning updates were provided to members of the NC PEV Taskforce during quarterly meetings across the state and provided an opportunity to collaborate towards tackling barriers to PEV readiness in the greater Charlotte area.
2.3 Public Engagement for the Greater Charlotte PEV Readiness Plan

To help engage stakeholders in meetings concerning the various work areas, and overall PEV readiness planning, a few different methods were used. These tactics were designed to best draw out the ideas of stakeholders, and gather their opinions to be incorporated into the plan to ensure the Greater Charlotte PEV Readiness Plan was driven by local interests and perspectives.

**Work Sheets**

Worksheets were created for the Incentives, Infrastructure and Education & Outreach topic areas. Each worksheet was passed out following the presentation of the topic area. All worksheets included a brief summary of the topic areas, and three to four pointed questions requesting stakeholder input. Stakeholders were generally given about ten minutes to contemplate and write down their answers to the questions. Discussions followed the completion of the worksheets, and stakeholders were able to project their ideas, and play off of the ideas of others. Worksheets are available in Appendix C.

**Ideal Electric Vehicle Supply Equipment (EVSE) Placement Surveys**

Regional maps were produced using geographic information system (GIS) data for each monthly meeting to gather information from local stakeholders relative to the topic area being covered at that time. Each map marked the location of that month’s meeting along with other information that would aid the exercise including indicators that identified the region’s largest employment centers and a 30-mile radius drawn around the meeting location to provide a perspective regarding the typical range of a PEV. The exercise allowed for an interactive opportunity to identify ideal locations for future charging infrastructure by placing small stickers with notes for chosen locations. For example, stakeholders who attended the June 2012 REVAC meeting in the Town of Concord considered Incentives and Economic Development when identifying their ideal locations for future charging infrastructure.

![Figure 7](image-url): Stakeholders identify ideal locations for future charging infrastructure at the completion of the May 2012 REVAC meeting at the City of Gastonia Conference Center.
The map below was created as a result of three Ideal EVSE Placement Surveys that occurred as part of the Regional Electric Vehicle Advisory Committee’s (REVAC) work. The image includes PEV charging station locations identified by stakeholders as “ideal” locations when considering the five work areas for PEV readiness. The exercise provided unique opportunities to identify locations for charging infrastructure using information from individuals who live, work and play in 9-county region.

**Figure 8:** REVAC stakeholders identify ideal locations for charging stations.

**LIVE Image:** This image is hyperlinked to CCFC’s Online Vimeo web-page. To watch the video, simply click the image if viewing this document in electronic form, otherwise, please visit: [http://vimeo.com/42808621](http://vimeo.com/42808621)

**Figure 9:** EV Charging Station Potential in the 9-county Centralina / Greater Charlotte Region
Community PEV Readiness Planning Blog
REVAC members and stakeholders outside the greater Charlotte PEV readiness planning area were also engaged through updates to the Greater Charlotte PEV Readiness Planning Blog. These updates generally included information on past and future events and infrastructure installations. Steering committee members who missed meetings could refer to the blog to read an overview of the meeting and view agendas and photographs.

The blog was housed under the NC PEV Taskforce website along with blogs for the greater Asheville, Piedmont Triad, and Research Triangle PEV Readiness Planning efforts: http://www.advancedenergy.org/transportation/ncpev/blog/charlotte/index.php.

Public Awareness Events to Gather Feedback for the Plan
The greater Charlotte community worked to host several public awareness events:

Revenge of the Electric Car
Centralina Clean Fuels Coalition (CCFC) hosted a free screening of the film ‘Revenge of the Electric Car’ at the Epicentre Theaters in Charlotte on the evening of September 18, 2012 as part of Regional EV Week. The event was held during the first day of the Hybrid Truck Users Forum (HTUF) Conference that occurred just two blocks away from the theaters at the Charlotte Convention Center. This allowed both members of the general public and conference attendees the opportunity to participate. Event partners included a local chapter of the Sierra Club, SustainCharlotte and Clean Air Carolina. These partners displayed educational materials at information tables during a pre-screening party. After the screening, CCFC staff provided a brief overview of the Greater Charlotte PEV Planning work including information on how to be involved in planning activities and then introduced a panel of experts to answer questions from the audience. Modern Nissan of Lake Norman sponsored the event and displayed a Nissan LEAF in the courtyard of the Epicentre for attendees to view.

Figure 10: PEV experts answer questions from the audience following ‘Revenge of the Electric Car’. Panelist included (from left to right): David Smith, City of Charlotte; Dr. Ewan Pritchard, NC State University; Jamie Bond, Duke Energy; Mr. John Dabels, former Marketing Director of the EV1 Project at General Motors; and Ms. Anne Tazewell, NC Solar Center.
CODA Ride & Drive

In early July 2012, Centralina Clean Fuels Coalition (CCFC) partnered with CODA Automotive to host a free Ride & Drive event featuring the California based company’s all-electric sedan. Held on North Tryon Street during lunch hours, a number of professionals who work in Uptown Charlotte stopped to look at the vehicle and ask questions about PEVs and charging infrastructure plans for the greater Charlotte area. Many participants were surprised to learn how many public charging stations were already installed around the city. The Ride & Drive provided CCFC staff the opportunity to both answer questions from the general public, but also ask for feedback about workplace charging, incentives and a number of other items important to working professionals in the area. Staff members of Centralina Council of Governments also attended the event to learn more about PEVs and how they can be integrated into the broader systems approach to regional planning.

National Alternative Fuel Vehicle Day Odyssey

CCFC celebrated the use of alternative fuel technologies during its Odyssey Day event in November 2012 at The Saloon at the NC Music Factory. The event took place in conjunction with the Carolina Raptor Center’s 2012 GoWILD Benefit Concert and featured a Nissan LEAF from Duke Energy. Concert tickets were given away to winners of a trivia wheel game that quizzed participants on their knowledge of PEVs and other alternative fuels. Winners enjoyed a live performance by a local Charlotte band and dinner served by The Saloon while supporting the Carolina Raptor Center’s conservation of birds of prey through research, education and the rehabilitation.
Ford Go Further Tour

The North Carolina Sustainable Energy Association hosted its annual conference in Charlotte on October 10-11, 2012. The conference, titled “Making Energy Work – Fueling Innovation” was kicked off with a pre-event hosted by Centralina Clean Fuels Coalition (CCFC) that featured Ford’s Go Further Tour. Over fifty conference participants, including leaders of North Carolina’s sustainable energy industry, and member of the general public were able to test-drive Ford’s new Focus PEV and CMAX PHEV. CCFC Chairman, Dave Navey of Duke Energy, was interviewed by members of the local media. Participants were given the opportunity to see two examples of PEVs that will soon be available for purchase in North Carolina and received a free gift certificate to Emeril’s Eatery on the Levine Avenue of the Arts after test-driving the vehicles. The event was included as part of the City of Charlotte’s Sustainability Week as designated by Mayor Anthony Foxx.

Figure 13: The Ford Go Further Tour came to Charlotte as part of the city’s Sustainability Week 2012. North Carolina is part of Ford’s Phase 2 Rollout of the new Ford Focus PEV. The Go Further Tour continued across the state and included events at a number of municipalities participating in PEV readiness efforts.

These events were used to spread awareness about the PEV readiness plan for the greater Charlotte area. More information on these events and those planned as a result can be found within the Education and Outreach section of this plan.
The leaders of the greater Charlotte PEV readiness plan reported community updates at the quarterly statewide taskforce meetings (including a state-wide teleconference in March, an in person meeting in the Piedmont Triad in June and in Charlotte in September of 2012).

At the September Taskforce meeting the planning leads for each of the community readiness plans in the greater Asheville, Charlotte, Piedmont Triad and Research Triangle areas, participated in breakout sessions with stakeholders from across the state. The Regional Electric Vehicle Advisory Committee chose three unique discussion points for the greater Charlotte area:

- **Academic Curriculum**: Discussed below in Education & Outreach
- **Motor Sports / NASCAR**: Discussed below in Education & Outreach
- **Workplace Charging**: Discussed below in Incentives and Economic Development

For more information about these discussion topics and the feedback received, please visit the associated chapter in the plan.
| Review public and private parking spaces for PEVs with or without charge stations to provide best practices document for parking locations in the region. |
| Research alternative transportation incentive programs currently in operation to seek opportunities tied to alternative fuels and transportation technologies. |
| Ask for NASCAR Industry Advise and expertise. |
| Engage NASCAR to partner with K-12 educational opportunities such as the EV Challenge. |
| NASCAR Race Teams associated with vehicle manufacturers who produce PEVs should consider using those vehicles as part of their fleet. |
| Explore opportunities for PEV leases so employees can take vehicles home and explore the technology. Example: US Department of Defense is leasing 500 volts for the Pentagon. |
| Explore opportunities surrounding NASCAR Racer's public service announcements. |
| Establish NC PEV Center at academic institutions. |
| Help community colleges make connection to PEV and EVSE job market. |
| Help large businesses tie PEVs into load management programs. |
| Work with STEP at NC State University to expand curriculum to Charlotte Region. |
| PEV valet services can maximize turnover on fast chargers and improve efficiency. |
| Connect and utilize social media outlets from partnerships created through PEV readiness efforts. |
| Explore both private and public PEV related mass transit options such as shuttles. Example: Hotel shuttles from Charlotte-Douglas Airport. |
| Expand availability and marketing of Ride & Drive events to make public more aware and comfortable with PEVs. Example: Host Ride & Drive at Carowinds Amusement Park. |
| Partner with rental car companies. |
| Bring PEV police cars to K-12 schools. |
| Explore PEV Recreational Vehicles for NASCAR events. |
| Use DesignLine electric buses at NASCAR events. |
| Advertise availability of HOV lanes for PEVs. |
| PEV focus at Career Day events. |
| Bring PEV car-share program to local universities. Example: Duke University |
| Provide K-12 teachers with information packet on how to integrate PEV education into GHG discussion in local schools. |

Table 1. Paraphrased Responses, NC PEV Taskforce September 2012 Meeting Community Break Out Session: Stakeholder Involvement
3 VEHICLES

3.1 Introduction to Plug-in Electric Vehicles (PEVs) Work Area

PEVs have continued to gain in popularity in North Carolina and in the greater Charlotte area as new models, and even new vehicle manufacturers, continue to enter the market. With this influx of new electric vehicle technologies, it has become increasingly challenging for buyers to understand their options.4

The Vehicles work area of this readiness plan covers goals related to tracking the number of PEVs in operation within the greater Charlotte community. The plan is also meant to provide information about PEVs to both governmental planners and potential EV drivers. The information contained in this topic area helps define the context for other topic areas within this plan as it shows the current extent of PEV deployment as well as future projections. Stakeholders involved in the vehicle working area of PEV readiness planning gave feedback about the suitability and cost-benefit comparison of PEV use versus the use of conventional ICE or hybrid vehicles. They also helped develop strategies to keep local fleets and other stakeholders both informed and interested in PEV adoption. This topic area evaluates national and state-level information to create local implementation strategies specific to the greater Charlotte area.

3.2 History of PEVs in the Greater Charlotte Region

Market Introduction

At the time of writing, the PEVs available for purchase and in use in North Carolina are:

- Chevrolet Volt
- Nissan Leaf
- Mitsubishi i-Miev
- Several other small-production models by Tesla, Fisker, CODA and Think.

Ford Motor Company has also released a PEV with the all-electric version of the Focus. Despite initial announcements in November of 2011 that Charlotte, NC would be among the first markets for a rollout in late 2011, it has currently only been distributed to dealerships in California, New Jersey and New York with plans to add another 13 states to that list this year.5 6

Several other models are expected to be deployed soon. (For a full discussion of the current and near-future model availability, please refer to the NC PEV Roadmap or to the “Plug-in Vehicle Tracker” at http://www.pluginamerica.org/vehicles)

**Electric Drive in the Greater Charlotte Region**

The Greater Charlotte Region has been home to a rich heritage of motorsports for over 80 years. In fact, some of the first organized automobile races occurred in the southeast area of the City of Charlotte. It wasn’t until 1949 when the first officially sanctioned NASCAR race was held at the former Charlotte Speedway near what is now Charlotte-Douglas International Airport. Authors of a study prepared for the North Carolina Motorsports Association state that “No other state in the nation can lay claim to long, rich heritage which motorsports has in North Carolina”.

While there is no doubt that the automobile has a significant place in the history of the greater Charlotte area, it may come as a surprise that electric vehicles first entered what is commonly referred to as “victory lane” as early as 1896 when an electric car built by the Riker Electric Motor Company won the first documented auto race in the United States. Held on a mile-long dirt course at the state fairgrounds in Rhode Island, automobile manufacturers sponsored the race to exhibit vehicles powered by electric, steam and gasoline. With seven vehicles in the competition, the Riker Electric finished first, completing the five mile race in about 15 minutes. Second place went to another battery-powered machine built by the Electric Carriage and Wagon Company. A gas-powered entry by Duryea Motor Wagon Company finished in third.

Just as the greater Charlotte area’s racing industry has seen significant gains in technology, so has the world of electric drive. As PEV makes and models continue to grow, there is an ever-expanding opportunity to work with fleet managers, auto dealers, rental agencies and others, to popularize electric vehicle adoption across the region. Leading corporations that call the region home, including Bank of America and Duke Energy, have adopted PEVs and integrated their associated benefits into business strategies that support sustainability goals and profitability. The University of North Carolina at Charlotte is home to the largest electric vehicle fleet of any academic institution in the state with over 100 EVs which on average displace over 12,000 gallons of petroleum each year. The Town of Marshville began purchasing vehicles that utilize electric drive in 2006 when fleet management replaced the town's older vehicle to display a clean air message and increase awareness among local citizens. With strong leadership from the academic, business and governments sectors across the greater Charlotte area, an increased adoption rate of PEVs will continue as additional makes and models become available.
3.3 NC PEV Taskforce: Vehicles Working Group

Members
Most members of the NCPEV Taskforce volunteered to be a part of the Vehicles Working Group at the launch meeting on October 27, 2011. Several others joined the working group over the course of the successive months of plan input. The final member list is included within the NC PEV Roadmap.

Members of this working group included representatives from private vehicle, equipment, and technology firms as well as public educational, governmental, and planning organizations from across the state.

Goals
During the first working group meeting, the group identified several possible goals. Many of the initial ideas for this topic area overlapped with those of other NCPEV Workgroups. Finding effective ways to promote the use of these vehicles, for instance, would fall under the Outreach Workgroup and, figuring out which incentives work for first-time adopters would fall under Incentives. While it was possible for this group to merge or partner with these groups to pursue these aims, it was decided that the Vehicles Working Group would remain independent while pursuing the following more fundamental goals and then join in with other workgroups if time allowed:

- Increase the available information about PEVs in the state, both now and on an ongoing basis, as a foundation for other PEV planning efforts.
- Reduce the barriers to PEV adoption in NC that pertain to the vehicles themselves.
- Predict the future of PEV deployment in NC in terms of the number, type, and uses of PEVs.

Focus Areas
The Vehicles workgroup decided to align its focus areas with those of the DOE sample plan, and then to add in other focus areas as needed to tailor the plan to the Greater Charlotte community.

- Assess and propose reductions to barriers to PEV adoption in NC that pertain to the vehicles themselves, such as vehicle availability, battery life, vehicle range, vehicle performance, and total cost of ownership.
- Establish regular communications with the NCDMV to collect information on the number, type, and location of registered PEVs in the state, both now and on an ongoing basis.
- Collect information from the Original Equipment Manufacturers (OEMs) on their plans for further PEV deployment in NC.
- Assess current usage of PEVs in public and private fleets in NC and estimate future usage.
- Collect information on the usage patterns of current PEV users.
3.4 Types of PEVs

**Battery Electric Vehicles (BEVs)**

BEVs (also called all-electric vehicles) use batteries to store the energy that powers one or more motors. The batteries are charged by plugging the vehicle into an electric power source. In addition, BEVs can be charged in part by regenerative braking, which generates electricity from some of the energy normally lost when braking. BEVs use no petroleum-based fuel while driving and produce no tailpipe emissions. Mainstream BEVs are targeting an approximately 100-mile range on a fully charged battery which is sufficient for more than 90% of all household vehicle trips in the United States according to the US Federal Highway Administration. For longer trips, EVs must be charged again. The time required for charging depleted batteries—which can range from less than 30 minutes to almost a full day—depends on the size and type of the batteries, as well as the type of charging equipment used.

<table>
<thead>
<tr>
<th>PEV Type</th>
<th>Battery Electric Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>2012 Nissan LEAF</td>
</tr>
<tr>
<td>Range</td>
<td>100 miles (Electric)</td>
</tr>
<tr>
<td>Price</td>
<td>$28,000 (after $7,500 tax credit)</td>
</tr>
<tr>
<td>Fuel Savings</td>
<td>$0.02 to $0.04 per mile (Electric)</td>
</tr>
<tr>
<td></td>
<td>Conventional gasoline vehicles cost $0.10 to $0.15 per mile.</td>
</tr>
</tbody>
</table>

**Plug-in Hybrid Electric Vehicles (PHEVs)**

PHEVs use batteries to power an electric motor and use a fuel, such as gasoline, to power an Internal Combustion Engine (ICE). Powering the vehicle some of the time with electricity from the grid cuts petroleum consumption and tailpipe emissions compared with conventional vehicles. On an empty battery, PHEVs perform like Hybrid Electric Vehicles (HEVs), consuming less fuel and producing fewer emissions than similar ICE vehicles. PHEVs have larger battery packs than HEVs, which provide an all-electric driving range of about 10 to 40 miles. During typical urban driving, most of a PHEV’s power can be drawn from stored electricity. Like BEVs, PHEVs can be plugged into the grid and charged, though the time required to charge depleted batteries is typically lower for PHEVs because most have smaller battery packs. In addition, PHEVs are charged by their ICEs and regenerative braking. PHEV fuel consumption depends on the distance driven between battery charges. For example, if the vehicle is never plugged in to charge, fuel economy will be about the same as for a similarly sized HEV. If the vehicle is driven less than its all-electric range and plugged in to charge, it is possible to use only electric power.

<table>
<thead>
<tr>
<th>PEV Type</th>
<th>Plug-In Hybrid Electric Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>2012 Chevy Volt</td>
</tr>
<tr>
<td>Range</td>
<td>35 miles (Electric) + 350 mile (Hybrid)</td>
</tr>
<tr>
<td>Price</td>
<td>$34,000 (after $7,500 tax credit)</td>
</tr>
<tr>
<td>Fuel Savings</td>
<td>$0.02 to $0.04 per mile (Electric) $0.05 to $0.07 per mile (Hybrid)</td>
</tr>
<tr>
<td></td>
<td>Conventional gasoline vehicles cost $0.10 to $0.15 per mile.</td>
</tr>
</tbody>
</table>
3.5 Greater Charlotte Region: Vehicles Working Area

Content Experts
Significant contributions were made by several local experts to direct the work of the Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) in exploring the Vehicles topic.

Local Champions
The following individuals served as local champions for the vehicles working area:

- Mr. Brian Bostic – Enterprise Holdings
- Mr. Stan Hinson – Modern Nissan of Lake Norman

Focus Areas
Tasks in the vehicles working area included developing a plan for PEV deployment in the Greater Charlotte Region consisting of the following:

- Estimate the number of PEVs anticipated to be privately owned for personal use, or either privately / publicly owned for fleet use, and analyze local case-studies to predict usage patterns in the 9-county community.
- Assess and propose any barriers to PEV adoption specific to the Charlotte region that pertain to the vehicles themselves, such as vehicle availability, battery life, vehicle range, vehicle performance, and total cost of ownership.
- Work with area dealerships and fleet managers to determine where PEVs have been purchased and what resources would aid the adoption of PEVs.

The Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) met to discuss the vehicles working area on May 24, 2012 at the City of Gastonia Conference Center. All but one of the eight dealerships selling PEVs at that time in the 9-county region attended the meeting, providing incredible insight into current adoption rates and usage patterns. Mr. Brian Bostic presented information regarding Enterprise Holding’s PEV strategy as implemented in California and helped stakeholders discuss how to replicate those concepts in North Carolina. Chevy Volts, Nissan LEAFs and the Mitsubishi i-Miev were parked at the conference center’s charging units for attendees to view.

Figure 17: REVAC members speak with staff from local dealerships at the May 2012 meeting focused on the vehicle working area.
3.6 Current Vehicle Adoption

Market Introduction
In September 2011 the Chevy Volt and Nissan LEAF became the first highway-ready electric vehicles for sale in the greater Charlotte region. In May 2012 the Mitsubishi i-Miev became the third electric vehicle available to consumers within the 9-county planning boundary. While the region is home to several PEVs from manufacturers such as CODA, Fisker and Tesla, these must be special ordered and are not currently available for purchase at any onsite location in North Carolina.

National Level
The first US Volt and LEAF sales took place in select markets at the end of December 2010. From December 2010 to October 2012, over 54,000 PEVs have been sold in the US. During this time the Volt and the LEAF have become available in all US markets. Meanwhile new makes and models of PEVs have been released in select markets, including the Mitsubishi I, the Toyota Prius Plug-in, the Ford C-Max, the Ford Focus EV, the Tesla Model S, the Fisker Karma, and the Coda Sedan. Over time sales of PHEVs have continued to outpace sales of BEVs like the Nissan LEAF.

Cumulative PHEV and BEV Sales in the US, December 2010 to October 2012*

![Cumulative PHEV and BEV Sales](chart.png)

*Monthly PEV sales data was not available from Tesla, Fisker and Coda
Sources: [www.greencarreports.com](http://www.greencarreports.com), [http://green.autoblog.com](http://green.autoblog.com)

PEV sales in the US are closely tied to trends in the price of gasoline. When US retail gasoline prices increase, PEV sales increase, and when gas prices decrease PEV sales usually decrease slightly. The clear exception to this rule is December 2011, when Nissan LEAF and Chevy Volt were first on sale nationwide. With each successive spike in gasoline prices, PEV sales reach new monthly highs.
Assuming gas prices do not fall, this trend can be expected to continue as new makes and models of PEVs are released and as existing PEV models become available in all US markets.

**Figure 19:** Relationship between PEV sales and price of gasoline.

**Sources:** www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm; www.greencarreports.com

**Vehicle Adoption in North Carolina**

In September 2011 the Chevy Volt and Nissan LEAF became the first highway-ready electric vehicles for sale in the greater Charlotte region. In May 2012 the Mitsubishi i-Miev became the third electric vehicle available to consumers within the 9-county planning boundary. While the region is home to several PEVs from manufacturers such as CODA, Fisker and Telsa, these must be special ordered and are not currently available for purchase at any onsite location in North Carolina.

Vehicle registration data from the North Carolina Department of Motor Vehicles (NCDMV) indicates that 719 plug-in electric vehicles were registered in North Carolina as of August 2012. PEV registrations are highest in the urban counties within the Triangle region, the Greater Charlotte Region and the Greater Asheville Region. These registrations include 439 PHEVs and 280 BEVs, reflecting the national trend in which PHEV sales have outpaced BEV sales.
Vehicle Registrations
According to the North Carolina Department of Motor Vehicles, 191 plug-in electric vehicles are currently registered within the 9-county Charlotte region as of August 2012. New vehicles are becoming available every model year, and are available through numerous dealerships across the region.

Based on interviews with auto dealers and PEV owners, these figures understate the total number of PEVs on the road in the Asheville region. Privately owned fleet vehicles such as those held by Duke Energy; for example, do not show up in the registration data.

Registered PEVs in North Carolina by County (August 2012)

Figure 20: Registered Plug-In Electric Vehicles in North Carolina by County as of August 2012.

PEV Dealerships in the Greater Charlotte Region
There are a total of twenty dealerships selling PEVs in the 9-county Greater Charlotte Region. These locations are specific to Chevrolet, Nissan and Mitsubishi. PEV manufacturers such as CODA, Fisker and Telsa do not currently have on-site dealerships or stores meaning vehicles must be special ordered. Tesla plans to open a service center in Raleigh, NC but does not plan to sell vehicles on-site.
Table 2: Dealerships in the 9-county Greater Charlotte Region that sell PEVs as of December 2012.

<table>
<thead>
<tr>
<th>Dealership</th>
<th>Address</th>
<th>Phone</th>
<th>PEVs Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Chevrolet</td>
<td>5101 East Independence Blvd Charlotte, NC</td>
<td>866-409-3466</td>
<td>Volt</td>
</tr>
<tr>
<td>Parks Chevrolet</td>
<td>6441 N Tryon St Charlotte, NC</td>
<td>704-598-4000</td>
<td>Volt</td>
</tr>
<tr>
<td>Steve Moore Chevrolet</td>
<td>9325 South Blvd Charlotte, NC</td>
<td>704-551-6400</td>
<td>Volt</td>
</tr>
<tr>
<td>Victory Chevrolet</td>
<td>801 W Charlotte Ave Mount Holly, NC 28102</td>
<td>704-827-6705</td>
<td>Volt</td>
</tr>
<tr>
<td>Parks Chevrolet at The Lake</td>
<td>15235 Statesville Rd Huntersville, NC 28078</td>
<td>704-875-6558</td>
<td>Volt</td>
</tr>
<tr>
<td>Randy Marion Chevrolet</td>
<td>220 W Plaza Dr Mooresville, NC 28117</td>
<td>704-664-3303</td>
<td>Volt</td>
</tr>
<tr>
<td>Ben Mynatt Chevrolet Cadillac</td>
<td>281 Concord Parkway South Concord, NC 28027</td>
<td>704-786-2151</td>
<td>Volt</td>
</tr>
<tr>
<td>Hendrick Chevrolet Cadillac</td>
<td>3112 W Highway 74 West Monroe, NC 28110</td>
<td>704-289-8444</td>
<td>Volt</td>
</tr>
<tr>
<td>Classic Chevrolet of Kannapolis</td>
<td>1520 S Cannon Blvd Kannapolis, NC 28083</td>
<td>704-933-1104</td>
<td>Volt</td>
</tr>
<tr>
<td>Dale Earnhardt Chevrolet</td>
<td>1774 NC 16 Newton, NC 28658</td>
<td>828-465-3251</td>
<td>Volt</td>
</tr>
<tr>
<td>Team Chevrolet Buick GMC Cadillac</td>
<td>404 Jake Alexander Blvd S Salisbury, NC 28144</td>
<td>704-680-6846</td>
<td>Volt</td>
</tr>
<tr>
<td>East Charlotte Nissan</td>
<td>6901 E Independence Blvd Charlotte, NC 28227</td>
<td>704-535-4012</td>
<td>LEAF</td>
</tr>
<tr>
<td>Modern Nissan of Lake Norman</td>
<td>18615 Statesville Rd Cornelius, NC 28031</td>
<td>704-237-5100</td>
<td>LEAF</td>
</tr>
<tr>
<td>South Charlotte Nissan</td>
<td>9215 South Blvd Charlotte, NC 28273</td>
<td>704-552-9191</td>
<td>LEAF</td>
</tr>
<tr>
<td>Modern Nissan of Concord</td>
<td>967 Concord Pkwy S Concord, NC 28027</td>
<td>704-788-2110</td>
<td>LEAF</td>
</tr>
<tr>
<td>Ben Mynatt Nissan</td>
<td>629 Jake Alexander Blvd S Salisbury, NC 28147</td>
<td>704-633-7270</td>
<td>LEAF</td>
</tr>
<tr>
<td>Classic Nissan of Statesville</td>
<td>1244 E Garner Bagnal Blvd Statesville, NC 28677</td>
<td>704-872-8500</td>
<td>LEAF</td>
</tr>
<tr>
<td>Mckenney-Salinas Mitsubishi</td>
<td>4295 Wilkinson Blvd Gastonia, NC 28056</td>
<td>(704)824-0900</td>
<td>i-MiEV</td>
</tr>
<tr>
<td>Larry Jay Mitsubishi</td>
<td>8415 South Blvd Charlotte, NC 28273</td>
<td>(704)551-6500</td>
<td>i-MiEV</td>
</tr>
<tr>
<td>Keffer Mitsubishi</td>
<td>13517 Statesville Road Huntersville, NC 28078</td>
<td>(704)947-7253</td>
<td>i-MiEV</td>
</tr>
</tbody>
</table>
Current and Future Availability of PEVs in North Carolina

The following chart illustrates PEVs currently available for purchase in North Carolina, PEVs targeted to enter the market in 2013 and PEVs anticipated in 2014 and beyond.

<table>
<thead>
<tr>
<th>When</th>
<th>Type</th>
<th>PEV</th>
<th>Driving Range</th>
<th>Battery (kwh)</th>
<th>MSRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Today</td>
<td>PHEV</td>
<td>Chevy Volt</td>
<td>35 miles + gas</td>
<td>16</td>
<td>$39,100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fisker Karma *</td>
<td>32 miles + gas</td>
<td>16</td>
<td>$96,000</td>
</tr>
<tr>
<td></td>
<td>BEV</td>
<td>Nissan LEAF</td>
<td>73 miles</td>
<td>24</td>
<td>$35,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mitsubishi i-Miev</td>
<td>62 miles</td>
<td>16</td>
<td>$29,900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tesla Model S *</td>
<td>300 miles</td>
<td>85</td>
<td>$88,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coda Electric Sedan *</td>
<td>88 miles</td>
<td>34</td>
<td>$39,900</td>
</tr>
<tr>
<td>2013</td>
<td>PHEV</td>
<td>Toyota Prius Plug-in</td>
<td>11 miles + gas</td>
<td>4.4</td>
<td>$32,000</td>
</tr>
<tr>
<td>Target</td>
<td>BEV</td>
<td>Ford C-Max Energi</td>
<td>21 miles + gas</td>
<td>9</td>
<td>$33,800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ford Focus Electric</td>
<td>76 miles</td>
<td>23</td>
<td>$40,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Honda Fit EV</td>
<td>82 miles</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chevrolet Spark</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>TBA</td>
<td>PHEV</td>
<td>Volvo V70 Plug-in</td>
<td>30 miles + gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIA Motors VTrux</td>
<td>40 miles + gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BEV</td>
<td>BMW Active E</td>
<td>94 miles</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toyota RAV 4 EV</td>
<td>100 miles</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VW E-Golf</td>
<td>95 miles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: PEV Availability in North Carolina Markets.

Figure 21: Toyota RAV 4 EV unveiled at the 2012 Electric Vehicle Symposium in Los Angeles, CA.
3.7 Deployment Estimates and Usage Patterns

Projected Future Personal and Fleet PEV Deployment

The Electric Power Research Institute (EPRI) has modeled the growth of the PEV market at the county level in the US over the next 20 years. This model has a high degree of error (somewhere around a factor of ten) but can be used as a starting point for discussions about what we can expect future PEV deployment to look like in the greater Charlotte region.

As with the overall market in the state, analysts seem to agree that the PEV market in the Charlotte area will grow slowly over the next few years, but it is then expected to pick up dramatically. Uncertainty of the exact degree of this increase grows when factoring in the potential impacts associated with the cost per gallon of petroleum, but the increase itself is not often questioned.

By 2015, EPRI estimates that there will be over 2,300 total PEVs in the 9-county Charlotte region. This number increases to over 14,900 by 2020. Assuming that the percentage of PEVs owned by individuals instead of fleets will remain constant at 90%, the estimate of personal use PEVs in 2015 is expected to be around 2,000 and in 2020 well over 13,000.

Validation of this model can be achieved only within its large given error range. That said, the model predicts that there will be 1289 PEVs in North Carolina by the end of 2012, which is relatively close to the actual figure expected to be realized given that there were 719 PEVs registered by the NC Department of Motor Vehicles as of August leaving the entire last quarter of 2012 for further growth.

Fleet adoption of PEVs may be expected to grow faster if the business case can be made to them. If EPRI’s total cost of ownership study is correct and PEVs can have a 2-6 year payback period, then they can be expected to save fleets a significant portion of their operations maintenance costs over a 10 year duty cycle (For a full discussion of the total cost of PEV ownership, please refer to the statewide NC PEV Roadmap). With their economies of scale, fleets may find it easier than individuals to overcome the higher initial purchase price for PEVs in order to take advantage of overall savings. Some of the largest commercial fleets, such as Frito Lay and FedEx, are already using PEVs for medium-duty delivery trucks. With 275 and 87 all-electric trucks deployed respectively in the US by the end of 2012, these two companies are helping to make that business case for all commercial fleets.

Responses to a survey of fleet managers in North Carolina conducted by the NC Solar Center show that NC fleets may have begun to see this business case already. Out of 242 respondents, close to 40% said that they either had a high level of interest in purchasing PEVs or that they already had them. Only 12% had no interest.
Projected Usage Patterns

The Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) determined that to best project usage patterns of both current and future PEVs within the community’s 9-counties, existing data included within Long-Range Transportation Plans should be correlated with PEV registration data from NC DMV and data showing the location of both currently installed and planned charging infrastructure.

Long Range Transportation Plans (LRTPs) typically take a three-decade look ahead to identify what transportation options best serve an areas needs and expectations. They also identify public transportation and highway projects, funding forecasts over a 30-year timeframe, multi-modal funding availability, sub-regional needs, and project performance measures. More importantly, LRTPs chart the latest regional population growth patterns and projections using information such as employment density models. With this information already available and kept current within local municipal planning organizations (MPOs) and rural planning organizations (RPOs), projecting the usage patterns of PEVs in the 9-county region can be estimated accurately and then also considered as part of broader transportation planning efforts.

Registered PEVs and Public Charging Sites in North Carolina (August 2012)

![Map of Registered PEVs and Public Charging Sites in North Carolina (August 2012) including 2011 annual average daily traffic by estimated vehicles per day on major corridors across the state.](image)

**Figure 22:** Registered PEVs and Public Charging Sites in North Carolina as of August 2012 including 2011 annual average daily traffic by estimated vehicles per day on major corridors across the state.
3.8 Recommendations

Table 4 provides recommendations derived from the individual and group feedback of the Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) and the discussions that followed.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time Frame*</th>
<th>Priority Level**</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Establish key partnerships with fleet managers, local governments, and dealerships.</td>
<td>On-going</td>
<td>High</td>
<td>Local Government, Statewide or regional non-profit</td>
</tr>
<tr>
<td>1.2 Correct misinformation that leads to perceived barriers to PEV adoption.</td>
<td>Long-term</td>
<td>High</td>
<td>Statewide or regional non-profit</td>
</tr>
<tr>
<td>1.3 Increase visibility and knowledge of the benefits of PEVs broadly through news media and in a more targeted way through social media, and owner testimonials.</td>
<td>Medium-term</td>
<td>Medium</td>
<td>Statewide or regional non-profit</td>
</tr>
<tr>
<td>1.4 Communicate the benefits and total cost of ownership of PEVs to public and private fleet managers.</td>
<td>Medium-term</td>
<td>High</td>
<td>Local Government, Statewide or regional non-profit</td>
</tr>
<tr>
<td>1.5 Provide authoritative third party information about PEVs to dealerships to help them respond to prospective PEV driver concerns.</td>
<td>Short-term</td>
<td>High</td>
<td>State-level taskforce, State or regional non-profit</td>
</tr>
</tbody>
</table>

*Term Lengths for Recommendations

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>1 to 2 years</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>3 to 5 years</td>
</tr>
<tr>
<td>Long-Term</td>
<td>6 to 10 years</td>
</tr>
<tr>
<td>On-going</td>
<td>No set start or end time</td>
</tr>
</tbody>
</table>

**Priority Levels for Recommendations

<table>
<thead>
<tr>
<th>Priority Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
</table>
4 INFRASTRUCTURE

4.1 Introduction to Infrastructure Work Area

The transportation sector has been proceeding down the path of electrification for more than a decade as evidenced by the growing adoption of standard hybrid electric vehicles (HEVs) such as the Toyota Prius. Although these vehicles still source all of their energy from an internal combustion gasoline engine, the incorporation of larger batteries, an electric motor, and associated components has helped improve fuel economy while advancing the technology and making it more affordable. Plug-in electric vehicles (PEVs) take electrification a significant step further by storing electricity provided by the local electricity grid onboard the vehicles. This provides a critical diversification of energy sources that can power the transportation sector using cleaner, cheaper, and domestic energy. However, it also introducing a paradigm shift in how vehicles are fueled - or charged in this case. This document will focus on the background, activities, best practices, as well as existing and future charging station needs to fuel plug-in electric vehicles in the state of North Carolina.

4.2 NC PEV Taskforce: Infrastructure Working Group

Goals and Objectives

The objective of NC Infrastructure Working Group was to develop recommendations, best practices, and forecasts related to electric vehicle charging infrastructure deployment to enable widespread plug-in vehicle adoption in the state of North Carolina. The following goals were outlined to support the team’s objective:

- Pull together educational information and resources regarding charging technology/vendors.
- Develop educational information and resources regarding the installation of charging infrastructure including best practices, flowcharts, and solution providers for all customer types.
- Develop ideal charging location considerations, macro and micro, to meet customer needs.
- Assess current market deployment of charging infrastructure and forecast future market needs along with ideal ratios of public stations related to future vehicle adoption.
- As available, collect current costs of installing charging infrastructure and provide recommendation to reduce costs as needed.
- Assess future grid impact along with providing recommendations to reduce future grid impact concerns.
- Identify range of infrastructure solutions and business models along with any recommendations to improve the marketplace.
4.3 The Greater Charlotte Region’s Background in Infrastructure

Organizations in the Greater Charlotte Region have been working to deploy EVSE since 2009. As of this writing, 152 stations have been installed at publicly available locations and 112 have been installed at private corporations for employees. Maps in following sections depict the locations of these stations.

The following organizations are examples of the region’s forward thinking. They have proactively installed charging infrastructure in anticipation of the projected increase in electric vehicles in the 9-county region. Each example demonstrates leadership in electric vehicle planning.

**Bank of America**

Headquartered in the City of Charlotte, Bank of America is the largest retail bank in the country and has been a leader in the industry for over 250 years. As a major employer with a widespread network of banking centers and other facilities, the company has taken steps to make it’s operations more energy efficient and have saved millions of dollars by dramatically reducing emissions, consumption and waste. Since 2007, Bank of America has allocated $1.4 billion toward new construction of green office facilities and banking centers, and intend to achieve LEED® (Leadership in Energy and Environmental Design) certification for them from the U.S. Green Building Council (USGBC®). As part of this commitment, Bank of America offers ten PEV charging stations at five locations in the Charlotte area. These include parking deck location for workplace charging at the Bank of America Corporate Headquarters, Fifth Third Bank and Hearst Tower parking decks. Bank of America continues to be a regional leader in the adoption of PEVs and charging infrastructure both for the 9-county Greater Charlotte Region and beyond.

![Figure 23: EV designated parking spaces with charging units owned by Bank of America at 111 East 7th St. Charlotte, NC.](image)
The City of Charlotte’s “Power 2” Champaign has been innovative in its efforts to implement energy-efficient initiatives, designed to make Charlotte a true national energy leader. The city’s vision collectively promotes efficiency education, environmental quality, and economic vitality. It is a goal that is a top priority, and crucial to Charlotte’s future as the new energy capital and support the city’s three part energy strategy.

In April 2012, the City of Charlotte activated 26 charging stations located on City-owned property with each including at least one handicapped-accessible charging station space. Stations are located at a variety of locations ranging from Charlotte Area Transportation System (CATS) Park & Ride deck to the Mecklenburg County Government Center and even the Mint Museum and residential apartments in South Charlotte.

Funded by the Energy Efficiency and Conservation Block Grant and as an investment in supporting the use of electric vehicles, the City of Charlotte does not be charge users at City-owned stations for a limited time. Motorists using the charging stations can subscribe to the ChargePoint network to reserve or check the availability of the stations. Chargepoint is the primary network providing charging station location and availability for drivers of electric cars. Area Chevrolet and Nissan dealerships have partnered with the City in the Power2 Charlotte campaign, helping to educate electric vehicle owners and the public about the availability of the charging stations and electric vehicle technology.

Duke Energy

Information provided by Duke Energy Carolinas. The information contained in this document pertains to Legacy Duke Energy Carolinas and should not be interpreted or presented as information from the combined company.

Duke Energy is greening its vehicle fleet by testing and using electric vehicles and plans to buy more. In 2009, Duke Energy made a commitment at the Clinton Global Initiative that by 2020, all new vehicle purchases will be electric vehicles. This represents an investment of hundreds of millions of dollars and has the potential to significantly reduce fleet costs and greenhouse emissions over the next 10 years. Additional information provided by Duke Energy Carolinas is included within the Chapter 8 – Utilities.

Figure 24: Duke Energy fleet vehicle charging at the Mint Street Parking Deck (410 S Mint St., Charlotte, NC)
City of Gastonia

In the fall of 2010, the City of Gastonia partnered with Centralina Clean Fuels Coalition (CCFC) to fund the installation of five (5) Level II public charging stations at the Downtown Gastonia Convention Center and the Schiele Museum. The city followed this award up with application for funds to purchase ten (10) Nissan LEAF vehicles through local Congestion Mitigation and Air Quality (CMAQ) grant dollars. The charging installations in the City of Gastonia were highlighted during a meeting of the Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) that focused on economic development and incentives which was held in Concord, NC. Ms. Kristy Crisp, Business Services Manager at City of Gastonia, provided an overview of the installations including a summary of how the charging infrastructure has supported her work in recruiting businesses and talented employees to make the City of Gastonia their home. Below is a graphic used to illustrate how municipalities can determine whether public infrastructure is appropriate in a number of scenerios:

More information regarding how municipalities can utilize PEV charging infrastructure to recruit businesses and a talented workforce can be found within the Incentives & Economic Development section of this plan.
**Discovery Place**

In 2012 the City of Charlotte provided funding for the installation of a solar array mounted on top of the Discovery Place Museum’s Parking Deck in Uptown Charlotte. This site was selected due to its high visibility, educational opportunities, and the available solar window. The project maximizes the use of commercially available photovoltaic system components to demonstrate leadership and serves as a model for similar projects within the community's public and private sectors. The project includes an educational kiosk that is connected to the photovoltaic system to monitor the energy production and savings. The solar tree generates energy for the electric vehicle charging stations that are located in the parking deck, and enables the Discovery Place building to conserve energy. Discovery Place hosted the Greater Charlotte REVAC meeting that kicked off PEV readiness planning in April 2012. This meeting occurred during the same day that the museum’s charging station was undergoing inspection.

**Town of Davidson**

The Town of Davidson has all of the indicators associated with an early adopting municipality. Located 20 miles north of Charlotte, N.C., Davidson is a small college town with engaged and active citizens who care deeply about their community. In September 2011, the town installed its first publicly available charging station at South Main Square. The Project for Innovation, Energy & Sustainability (PiES), a local “green” business incubator, partnered with Raleigh-based Praxis Technologies to bring the charging station to Davidson. Praxis received funding through the N.C. Green Business Fund to install the charging station which provides 7.2 KW Level II charging.

**Figure 27:** Stakeholders view the solar array and newly installed PEV charging infrastructure during the April 2012 REVAC meeting at Discovery Place in Charlotte.

**Figure 28:** EV charging unit at 422 South Main St., Davidson, NC 28036
4.4 PEV Charging Infrastructure

*Key Charging Terms*

**Charger** is a device to change alternating power (AC) wall power into direct current (DC) power for charging the battery. For AC charging levels defined in the SAE-J1772 ™ standard, the charger itself is located onboard the vehicle. For DC charging levels, the charger is located within the electric vehicle supply equipment off board the vehicle.

**Electric Vehicle Supply Equipment (EVSE)** provides AC wall power to the vehicle to be used by the onboard charger. This is the external hardware and is an element in an infrastructure that supplies electric energy for the recharging of electric vehicles or plug-in hybrid electric-gasoline vehicles. An EVSE for AC charging levels does not include a charger despite the fact it is often referred to as a “charging station”.

EVSEs are generally found in three configurations: Pedestal, Pole, Wall Mount or Ceiling Mount.

**SAE J1772™** is the Society of Automotive Engineers (SAE) standard for conductive charging. It sets the industry wide standard for the charging connector and communications protocol.

**SAE J1772™ AC Connector** is known as the “universal plug” designed for single phase electrical systems with 120 V or 240 V such as those used in North America and Japan. The round 43 mm diameter connector has five pins, with 3 different pin sizes:
- AC Line 1 and AC Line 2 - have same size power pins
- Ground Pin
- Proximity Detection and Control Pilot - have same size pin
The connector uses a 1 kHz square wave at +/- 12 volts generated by the Electric Vehicle Supply Equipment (EVSE), i.e. the charging station, on the pilot pin to detect the presence of the vehicle, communicate the maximum allowable charging current, and control charging. Practically all new plug-in electric vehicles are standardized on the J1772™ connector.

**Figure 29:** SAE J1772™ AC/DC Combo Connector

**SAE J1772™ AC/DC Combo Connector** is a new standard that expands the standardized SAE connector listed above to also include the ability to charge with low and high power Direct Current (DC) electricity. This is enabled by the addition of two DC pins below the existing AC pin design as depicted in the figure below. Despite the new functionality, the vehicle ports and connectors will maintain backward compatibility with the AC Level 1 and 2 charging levels. The largest seven automakers in the U.S. and Europe have all agreed upon this new SAE standard to incorporate DC fast charging capability in future models, some expected in 2013. Note that some Japanese auto manufacturers are currently using a Japanese DC fast charging connector and system called CHAdeMO and at that time of this report publishing have not agreed to adopt the new SAE combo connector solution for DC fast charging.

**Figure 30:** SAE Combo Connector courtesy SAE International

**CHAdeMO DC Fast Charging** is the trade name of a fast charging solution currently adopted by several Japanese automakers to deliver up to 62.5 kW of DC power via a specialized connector. Several early battery electric vehicles in the marketplace currently offer this solution as the SAE North American standard was not in place when the vehicles were developed. Although the European and North American automakers have announced their plan to incorporate the new SAE combo connected standard, it is possible that some Japanese automakers will continue with this solution.

**Figure 31:** CHAdeMO DC fast charge connector.
Note that all vehicles will still be capable of utilizing the SAE AC level 1 and level 2 connector and charging levels regardless of the DC charging solution, although the CHAdeMO option will require a separate DC charging inlet in addition to the AC inlet.

**Wireless Charging** is a technology that utilizes magnetic resonance to charge a vehicle without a physical connection to the vehicle. Energy is transferred from a transmitting coil in the parking pad located on the ground and converted into an electrical current by the receiving coil mounted under the vehicle. Standards are still under development for this technology although prototypes are available today from several companies.

**Inductive “Paddle” Charging** uses electromagnetic fields to transfer energy between a vehicle and a charging appliance without a direct conductive coupling. Although similar to wireless charging, this technology does not transmit through an air gap but rather utilizes a “paddle” that is inserted into an opening on the vehicle side. This is a legacy technology used with previous generations of electric vehicles and it not currently used in newer vehicles.

**Access to Charging Infrastructure**

Using electricity to charge a vehicle and power transportation will necessitate a paradigm shift in how vehicle owners are used to “fueling” their vehicles. In the past, a gasoline vehicle owner might typically wait until the fuel gauge is close to empty and then pull into any one of numerous public gas stations. Over the course of five to ten minutes, the driver will transfer 10 to 15 gallons of gasoline into an average light duty vehicle providing another 250-300 miles of range. With plug-in electric vehicles, the paradigm will shift from infrequent and large transfers of energy (range) to more frequent but smaller transfers of energy.

Although battery technology is rapidly advancing, batteries in plug-in electric vehicles still have a lower effective energy density compared to gasoline vehicles. This means that to provide the same range in miles that drivers are typically used to with gasoline vehicles would require a very large and heavy battery. This in turn would drive the cost up for the vehicle and the fuel efficiency down. However, plug-in vehicles are able to leverage several factors that still allow them to fulfill the driving needs of most consumers:

1) Most daily driving patterns are relatively short, allowing for modest sized battery electric vehicles (BEV) batteries that are affordable and can still provide over twice the range that drivers travel on an average day. An Electric Power Research Institute (EPRI) analysis of a national commuting pattern survey showed that nearly 80% of total daily driving distances are less than 40 miles and nearly 95% are less than 100 miles. Note that with plug-in hybrid electric vehicles (PHEV) or extended range electric vehicles (EREV), there is no effective range limit as a gasoline engine can take over once the batteries are fully depleted.
2) Vehicles spend over 95% of the time parked in not in use. A vast majority of this time is at home, but also at workplace and commercial locations. All of this downtime allows a vehicle to replenish its battery charge over a longer period of time while not being attended by the driver. Frequent “topping off” of a plug-in electric vehicle can also enable greater range for battery electric vehicles and a greater utilization of electric drive for plug-in hybrid electric vehicle.

3) Although gas stations are numerous especially in high density regions, a gasoline vehicle driver still depends on accessing a public station for all of their fueling needs. Access to electricity on the other hand is ubiquitous and while some public charging will be necessary, the vast majority of charging will take place in the convenience of a driver’s residence.

So instead of weekly trips to the gas station, a plug-in vehicle owner will likely just plug in at home and charge overnight to achieve most of their fueling needs, perhaps with the occasional charge at work or at a public station. The following graph is a visual approximation from EPRI of the three main categories of charging and their relative use:

**Residential Charging**

Residential charging, or charging at a fleet depot for fleet vehicles, will be able to accommodate the vast majority of charging needs for most vehicles. As noted before, electricity service is provided at practically every location although access to a dedicated circuit or outlet close to a vehicle’s parking location may need to be verified. Since residential and fleet depot charging is often dedicated to specific vehicles privately owned this category is normally considered “private”.

![Figure 32: Charging pyramid representing expected distribution of PEV charging infrastructure. (Courtesy of Argonne National Laboratory)](image-url)
Workplace Charging

The second most utilized location for charging will likely be at work. The dwell times for vehicles is the second longest behind the home, often 8-9 hours, providing more than enough time to replenish the electricity used on the drive to work. Many companies view providing access to charging infrastructure for their employees as another fringe benefit and a way to differentiate themselves in the competition for talented employees. SAS, Qualcomm, Siemens, and Bank of America are just a few major employers in North Carolina that already provide such access to charging infrastructure at work. Although some employers may opt to make their chargers available to the public, this category is often reserved for employees and thus considered “private”.

Public Access Charging

Public charging access is represented as the tip of the pyramid – the least likely to be fully utilized but still fulfilling a critically important role. First, they provide peace of mind for those driving pure battery electric vehicles by increasing the effective vehicle range of BEVs when needed and providing confidence for those occasional trips where the total range might be tested. Second, it provides the opportunity to replenish PHEVs and EREVs so that they can maximize their electric drive utilization and thus their return on investment. Finally, these stations provide vital access to those who may not have access to charging at home (e.g. downtown condos) or at work.

For more information on PEV Infrastructure including types of charging stations, pros and cons of different charging station levels and best practices please refer to the NC PEV Roadmap.

4.5 Greater Charlotte Region: Infrastructure Working Area

Content Experts

Significant contributions were made by several local experts to direct the work of the Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) in exploring the infrastructure topic area. Representatives from local dealerships, utilities, and transit agencies provided expert perspectives on the obstacles and opportunities to PEV adoption in the 9-county Charlotte area.

Local Champions

The following individual served as local champion for the vehicles working area:

- David Smith – City of Charlotte
- Jamie Bond – Duke Energy
Focus Areas
The Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) considered the following questions for deployment of charging infrastructure:

- Catalogue existing charging infrastructure and add to Alternative Fuel Data Center (AFDC)
- Study EPRI Model data for 9-county Centralina region
- Refine EPRI Model data using regional data, reports and statistics
- Facilitate the deployment of charging infrastructure in the region

4.6 Charging Infrastructure Planning

Local Approach
The Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) recognized four barriers to deploying a network of charging stations that can advance the adoption of PEVs:

- Lack of DC Fast Charging in and between metro areas
- Lack of awareness of existing charging infrastructure
- Cost of installing electric vehicle charging infrastructure
- Absence of charging station infrastructure within long-range transportation plans (LRTP)

Figure 33: Graphic illustrating community approach to infrastructure planning.
Public Charging Sites in North Carolina by County August 2012

Figure 34: Map of Existing Public Charging Locations in NC (as of 8/20/12).
Private Charging Sites
in North Carolina by County
August 2012

Figure 35: Map of Existing Private Charging Locations in NC (as of 8/20/12).
4.7 Recommendations

Table 5 provides recommendations derived from the individual and group feedback of the Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) and the discussions that followed.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time Frame*</th>
<th>Priority Level**</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Identify and approach key stakeholders about hosting EVSE</td>
<td>On-going</td>
<td>High</td>
<td>CCFC</td>
</tr>
<tr>
<td>2.2 Map existing EVSE and disseminate information</td>
<td>On-going</td>
<td>High</td>
<td>CCFC</td>
</tr>
<tr>
<td>2.3 Raise awareness about existing EVSE hosted by your organization</td>
<td>On-going</td>
<td>Medium</td>
<td>EVSE hosts</td>
</tr>
<tr>
<td>2.4 Identify funding opportunities and develop proposals for EVSE deployment</td>
<td>On-going</td>
<td>High</td>
<td>CCFC</td>
</tr>
<tr>
<td>2.5 Distribute guidance info on EVSE benefits, costs, siting and installation</td>
<td>Short-term</td>
<td>Low</td>
<td>CCFC, NC PEV Taskforce</td>
</tr>
<tr>
<td>2.6 Educate developers about pre-wiring for EVSE during new construction</td>
<td>Mid-term</td>
<td>Medium</td>
<td>CCFC</td>
</tr>
<tr>
<td>2.7 Map focus areas for future public EVSE deployment</td>
<td>Short-term</td>
<td>Medium</td>
<td>CCFC, MPOs</td>
</tr>
<tr>
<td>2.8 Educate electrical contractors on proper EVSE installation</td>
<td>On-going</td>
<td>Medium</td>
<td>Local governments, NC PEV Taskforce, Utilities</td>
</tr>
</tbody>
</table>

*Term Lengths for Recommendations

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>1 to 2 years</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>3 to 5 years</td>
</tr>
<tr>
<td>Long-Term</td>
<td>6 to 10 years</td>
</tr>
<tr>
<td>On-going</td>
<td>No set start or end time</td>
</tr>
</tbody>
</table>

**Priority Levels for Recommendations

<table>
<thead>
<tr>
<th>Priority Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
</table>
5 POLICIES, CODES AND STANDARDS

5.1 Introduction to Policies, Codes and Standards Work Area

Local policy, codes and standards can be either help to ensure a more seamless adoption of PEVs into the Greater Charlotte market or hinder the process. This chapter explores the various local policies which may need to be reviewed or modified for Plug-in Electric Vehicle (PEV) readiness. The Regional Electric Vehicle Advisory Committee focused on two overarching goals as part of this working area:

- Identify or eliminate processes or requirements that may unintentionally inhibit the adoption of PEVs or the installation of PEV charging infrastructure while creating policies, codes or ordinances that foster adoption of PEVs and installation of PEV charging infrastructure.\(^7\)
- Educate, discuss and gather feedback from local stakeholders in various policy positions.
- Review existing policies, codes and standards within the 9-county community and ensure consistency with statewide recommendations.

Local Example of Importance of Codes

Permitting is an important part of the plug-in electric vehicle adoption process. In the 1990s one major obstacle to the adoption of PEVs was the amount of time it took to install a charging station – almost three months! Customers who purchased a PEV were unable to charge their vehicles at home until they installed their residential charging station, which required a permit. This made adoption of PEVs much less attractive and PEV manufacturers want to avoid dealing with the same situation again. As such, they are targeting communities for early launch that are actively addressing the permitting process as well as related local building codes.\(^8\)

Today, many of the Plug-in Electric Vehicle purchasers will be installing charging stations in their homes. It is important the local governments not only develop streamlined and effective permitting processes, but also that they coordinate with key stakeholders such as electric utilities so that they can monitor the local impact to the grid.

---

\(^7\) Community Planning Guide for Plug-in Electric Vehicles, Advanced Energy
\(^8\) Community Planning Guide for Plug-in Electric Vehicles, Advanced Energy
5.2 Existing PEV Policies, Codes and Standards in the Greater Charlotte Region

**Existing Community Policies Codes and Standards**

### Existing Initiatives

**City of Charlotte:**
- Trade Internet Permitting (TIP) System for Streamlined Permitting (permitting flowchart attached)
- Power2Charge Public Outreach Campaign
- Greenhouse Gas Emission Reduction Standards

**Advanced Energy**
- Developed Community Planning Guide
- Developed Charging Station Installation Handbook

---

**Figure 36:** Mecklenburg County Handout for Charging Station Installations
5.3 NC PEV Taskforce: Policies, Codes and Standards Working Group

Members and Background
The level and effectiveness of policy, codes and standards concerning PEVs can greatly affect North Carolina’s capacity to support the vehicles on its roadways as well as its appeal to related opportunities. Members of the Policy, Codes and Standards group helped to identify existing policies that can easily be adopted to help promote PEVs.

Most members of the NCPEV Taskforce volunteered to be a part of the Vehicles Working Group at the launch meeting on October 27, 2011. Several others joined the working group over the course of the successive months of plan input. The final member list is included within the State PEV Roadmap.

Members of this working group included representatives from private vehicle, equipment, and technology firms as well as public educational, governmental, and planning organizations from across the state.

Goals
The goals of the Policies, Codes & Standards working group are to engage local planning and code enforcement officials in PEV focused activities, identify local ordinances and policies which might hamper PEV adoption and share best practices for local ordinances, policies and standards which streamline the installation process and incentivize the provision of publicly accessible charging infrastructure.

Barriers
The primary PEV adoption barriers in the Charlotte region related to Policies, Codes and Standards were identified as:

- ADA requirements that discourage EVSE deployment
- Guidance for local planners
- Lack of parking policies & enforcement
- Lack of clear parking and way-finding signage
- Inconsistent and un-streamlined permit & inspection

State-level Policies, Codes & Standards Strategies
The CVC will address barriers related to Building Codes, ADA compliance, and Zoning through the NC PEV Taskforce. Many of the Policies, Codes and Standards strategies for the Asheville area will center around disseminating guidance developed by the NC PEV Taskforce and supporting their state-level initiatives. Below is a Task List for the NC PEV Taskforce’s Policy Codes and Standards Working Group:
- **American Disabilities Act (ADA)** - Recommend standards based on national trends, local case-studies and NC Dept. of Insurance guidance.

- **Signage** - Develop guidebook for signage based on federal recommendations and other emerging standards.

- **Building Codes** -
  - Review current codes for applicable regulations
  - Approach NC Building Code Council for guidance

- **Permitting** -
  - Recommend expedited permitting system for EVSE
  - Establish “flag” of EVSE / PEV related permits in order to track installations

- **Zoning Codes** -
  - Approach local planning professionals to establish zoning standards and recommendations for PEVs and charging infrastructure
  - Address encroachment agreement and right-of-way issues

- **Technical Training** - (coordinate w/ Education & Outreach working group)
  - Electrical Inspectors
  - Contractor Certification
  - Inspection Groups

- **Case Studies** - Collect case-studies of local ordinances that facilitate the installation of publicly available charging infrastructure and support public access.

- **Legislative Considerations** -
  - Gas Tax Issue
  - NC Clean Energy and Economic Security Act- “Establish criteria for electric vehicle charging stations at highway rest stops.”

- **Model Plans** - Identify and collect local plans and policies; i.e., Durham City-County Electric Vehicle and Charging Station Plan
5.4 Greater Charlotte PEV Plan: Policies, Codes and Standards Work Area

Content Experts
The following content experts were invited to attend and participate in REVAC meetings which covered policies, codes and standards:

- Building Development Commissions
- Permitting officials for local jurisdiction (including permitting office managers and inspectors)
- Planning Directors and Zoning Officials

Local Champions
The following individuals served as local champions for the vehicles working area:

- Mr. Joseph Weathers - Mecklenburg County Code Enforcement

Community Breakout Session at September 2012 NC PEV Taskforce Meeting
As part of the NC PEV Taskforce meeting in Charlotte on September 19, 2012, the leads of the REVAC held a breakout session with Taskforce participants to discuss a few key topics/issues being considered for the Greater Charlotte PEV Readiness Planning Process. The participants were asked to provide feedback by answering questions in regards to permitting.

Question Posted to NC PEV Taskforce Breakout Session Participants:
Permitting: Many local governments are not tracking permitting of charging stations. We would like to discuss ways to encourage tracking of electric vehicle charging station permitting and also future considerations for installations that may not require a contractor.

Table 6 shows a summary of the responses, which ranged from adding a check box onto permitting applications to educating permitting officials to even involving local community colleges to help track permits. Key takeaways: the updated process would need to be simple to implement and not add additional time into the permitting process.
Table 6. Paraphrased Responses, NC PEV Taskforce September 2012 Meeting, Community Breakout Session: Permitting

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add a check box or field to identify charging stations onto permit application</td>
<td></td>
</tr>
<tr>
<td>Some counties are permitting charging stations but are not tracking (need to explain the importance of tracking permits and reporting to key stakeholders such as the electric utility)</td>
<td></td>
</tr>
<tr>
<td>This should be simple enough to make staff aware of the need to ask questions. Add a special check box on the building permit form; may be even highlighted in different color. Look at Mecklenburg County TIP System for guidance.</td>
<td></td>
</tr>
<tr>
<td>Create ongoing Greater Charlotte charging station implementation group to continually revise/update charging station location forecasts</td>
<td></td>
</tr>
<tr>
<td>Local universities and community colleges could work with local governments to track permitting of charging stations.</td>
<td></td>
</tr>
</tbody>
</table>

**Permitting**

REVAC will serve as clearing house for information on EVSE permit & inspection processes, and for information on procedures that create barriers to EVSE installation. REVAC will post the EVCS Permit & Inspection Survey responses from the AHJs in the Charlotte region on the CVC website as a resource for organizations and individuals interested in installing a charging station. Charging station owners and electrical contractors can also report issues with local permit and inspection processes that might discourage future EVSE deployment.

**Parking**

As the demand for public and workplace charging expands in the region it will become increasingly important to preserve PEV driver access to parking spaces with charging stations.

Parking policies should not only prevent conventional gas vehicles from parking in these spaces, but also discourage fully charged PEVs from remaining in high demand spaces.

The Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) will conduct a survey of parking enforcement policies at public and workplace charging stations in the Charlotte region with the help of the Centralina Clean Fuels Coalition, review best practices identified by the NC PEV Taskforce, and work with local charging station hosts to develop and refine PEV-friendly parking policies at public and workplace charging sites.
Parking Enforcement

Parking enforcement was reviewed at the state-wide level as well as with REVAC stakeholders, however the committee deferred this research to the state-wide working group because the was this topic is not unique in the Charlotte area.

Example: The City of Raleigh’s City Council passed the first parking enforcement ordinance in the state in 2012. This was reviewed at the NC PEV Taskforce Policy, Codes and Standards working group and is included in the state roadmap. The ordinance indicates that an electric vehicle must be plugged in and charging at electric vehicle parking spaces or will be fined.9 (See Figure 37).

Regulatory signs can be used to permit parking spaces designated for EV charging, however, these signs are only informational and cannot regulate parking for the sole use of EVs unless supported by local ordinance. In most case studies of EV only parking in North Carolina, local ordinances are not in place to support regulation and instead, rely on public acceptance that the sparking space(s) are reserved for a special purpose as indicated by signage that in most cases, is unique to any given municipality. The example below shows two EV only designated parking spaces in a high-traffic location that is not regulated by local ordinance:

---

9 http://www.parks.raleighnc.gov/home/news/content/CorNews/Articles/ElectricVehicleParkingOrdinance.html
**Signage**

Standardized PEV signage is important to raising the awareness of available charging infrastructure in North Carolina. Through the standardization of signage, wayfinding and other identification mechanisms, charging infrastructure will become more familiar to North Carolinians while increasing confidence in both the safety and reliability of this technology. The following are examples of signage recommended to be used in North Carolina based on best practices and emerging standards:

**General Service Sign**

![EV Charging (MUTCD)](image)

**Regulatory Signage**

![EV Parking Only](image)  
![EV Charging Only](image)

**Wayfinding Signs**

![Advance Turn and Directional Arrow Auxiliary Signs for use with General Service Signs](image)

*Figure 39:* Examples of General Service, Regulatory and Wayfinding EV Signage. Local example also included from the City of Charlotte (505 S Tryon St Charlotte NC 28202)
Plans
Research revealed numerous benefits of including electric vehicle readiness planning at several levels of planning documents including comprehensive plans, and strategic plans. In certain cases, such as zoning, state law requires that zoning amendments are justified by showing how they are consistent with the adopted comprehensive land use plans. Examples of local plans discussed among stakeholders included:

- **Comprehensive Land Use Plans:** It is recommended to include language in the Comprehensive Land Use Plan to encourage PEVs and associated infrastructure such as charging stations. Encouraging these technologies can help to achieve many goals that a comprehensive plan may already have such as greenhouse gas reduction and air quality goals. Additionally, this will provide the justification needed for local ordinance modifications.\(^\text{10}\)

  Example: The City of Raleigh, in Chapter Three of their Comprehensive Plan, has included policy language in its comprehensive plan to encourage the adoption of electric vehicles and electric vehicle infrastructure.\(^\text{11}\)

- **Strategic Plans:** Strategic Plans are local government plans provide specific goals and details on how to provide implementation.

  Example: Durham City/County Electric Vehicle and Electric Vehicle Charging Station Plan- The joint Sustainability office for the City and County worked with department heads and local leaders to develop a strategic plan which provided specific guidance for the installation and maintenance of the city/county owned fleet vehicles and charging station installation.\(^\text{12}\) (Appendix H).

- **Small Area Plans, Streetscape Plans:** A small area plan will provide greater details on the character of a certain area within the city or county limits. It is recommended that PEV considerations are worked into these plans. Things such as charging station installations should be considered. There are no local examples of these plans incorporating electric vehicles; however the steering committee discussed including PEV considerations.

Workplace Charging Districts
Many local employers in the Charlotte region have installed charging stations for their employees. For the Greater Charlotte PEV Readiness Plan, the steering committee was unable to look into this topic in much detail but recommends exploring further.

---
\(^\text{10}\) Consistency statement with Comprehensive Plan for Zoning Amendments are required per NC General Statutes 160A Article 19 and 153A Article 18
\(^\text{11}\) [http://www.raleighnc.gov/business/content/PlanLongRange/Articles/2030ComprehensivePlan.html](http://www.raleighnc.gov/business/content/PlanLongRange/Articles/2030ComprehensivePlan.html)
\(^\text{12}\) [http://durhamnc.gov/ich/cmo/sustainability/Pages/EVCS.aspx](http://durhamnc.gov/ich/cmo/sustainability/Pages/EVCS.aspx)
Zoning Ordinances

Zoning Ordinance and Unified Development Ordinance updates were discussed at the NC PEV Taskforce Policy, Codes and Standards Working Group. Research for the zoning ordinance section was pulled from a variety of locations including:

- A Toolkit for Community Plug-In Electric Vehicle Readiness- California Plug-In Electric Vehicle Collaborative- www.pevcollaborative.org
- Zoning Amendment for Electric Vehicle Charging Stations- Methuen Massachusetts
- APA Zoning Practice for Electric Vehicle Infrastructure
- Electric Vehicle Infrastructure: A guide for Local Governments in Washington State
  - Plug conducted a phone interview with Planner in Washington State who was lead in developing the model guidelines.

Stakeholders in the Charlotte region discussed considerations and interpretations at the local level. Below is a list of some of the discussion items:

- Definitions
  - Include electric vehicles in the definitions. This can help with consistent enforcement.
  - Included electric vehicles in the definitions. The steering committee agreed that it was best to include the electric vehicle in the definitions and to consider allowing level one and level two as accessory uses and to level three including battery exchange stations and a commercial use.

- Table of Permitted Uses
  - The committee discussed including charging stations in the table of permitted uses to avoid improper classification from code officials who may not be familiar with charging stations. The fear is that charging stations may be classified as a refueling station which would not be an appropriate comparison due to the large difference in how they operate.

- Streets, Sidewalks and Public Places
  - This section reviewed considerations for on street parking. More information is included within the NC PEV Roadmap.
➢ Off Street Parking
  o The design criteria for off-street parking considers for where a charging station should be placed in consideration with other site elements.

➢ Lighting
  o Development ordinances generally require that all uses within a site are properly lit. This should be considered for charging stations. Users should have proper lighting for safety and for operation of a charging station at night.

➢ Architectural Requirements
  o Generally architectural requirements cover building materials, color requirements and screening. The Regional Electric Advisory Committee indicated that charging stations may be considered “electrical or mechanical requirement” if so it may require that the charging station be screened. This is an unintended consequence because the charging stations need to be highly visible to the public including drivers of electric vehicles.

➢ Signage
  o Ensure that the proper wayfinding and informational signage is permitted for charging stations.

_Historic Districts_

➢ Permitting charging stations (certificate of appropriateness) - permitting charging stations should be similar to permitting a use such as a satellite dish, which requires a certificate of appropriateness. One of the biggest barriers to electric vehicle adoption, within a local historic district, may be the local commissions who may not be familiar with charging stations and in turn disapprove the request.

➢ Educational materials can be produced to inform local historic commissions on charging stations as well as best practices for installations.

_Encroachment Agreements_

Encroachment agreements were discussed at the NC PEV Taskforce PCS working group.
5.5 Recommendations

Key strategies to address the barriers related to policies, codes and standards in the Greater Charlotte Region are detailed in the table below:

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time Frame*</th>
<th>Priority Level**</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Parking: Survey of parking enforcement policies</td>
<td>On-going</td>
<td>High</td>
<td>CCFC</td>
</tr>
<tr>
<td>3.2 Parking: Development &amp; enforcement of EV parking policies</td>
<td>On-going</td>
<td>Med</td>
<td>Local governments</td>
</tr>
<tr>
<td>3.3 Permitting: Administer EVSE Permit &amp; Inspection Survey and distribute Results</td>
<td>On-going</td>
<td>Med</td>
<td>CCFC</td>
</tr>
<tr>
<td>3.4 Permitting Serve as clearing house for information on EVSE permit &amp; inspection processes, and information on procedures that create barriers to EVSE installation</td>
<td>On-going</td>
<td>High</td>
<td>CCFC</td>
</tr>
<tr>
<td>3.5 Signage: Facilitate deployment of needed parking and way finding signage on local and state roads</td>
<td>Short-term</td>
<td>High</td>
<td>CCOG, local governments, NC DOT, FBRMPO</td>
</tr>
<tr>
<td>3.6 ADA: Distribute ADA best practices developed by NCPEVTF to local governments</td>
<td>Mid-term</td>
<td>Med</td>
<td>CCFC</td>
</tr>
<tr>
<td>3.7 Zoning: Approach local planning professionals to establish zoning standards based on NCPEVTF recommendations</td>
<td>Short-term</td>
<td>High</td>
<td>NCPEVTF, CCOG, local governments</td>
</tr>
<tr>
<td>3.8 Building Codes: Provide support to NCPEVTF and work with NC Building Code Council on codes that require EVSE wiring in new construction and renovation</td>
<td>Long term</td>
<td>High</td>
<td>NCPEVTF</td>
</tr>
</tbody>
</table>
**Term Lengths for Recommendations**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>1 to 2 years</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>3 to 5 years</td>
</tr>
<tr>
<td>Long-Term</td>
<td>6 to 10 years</td>
</tr>
<tr>
<td>On-going</td>
<td>No set start or end time</td>
</tr>
</tbody>
</table>

**Priority Levels for Recommendations**

<table>
<thead>
<tr>
<th>Priority Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
</table>
6 EDUCATION AND OUTREACH

6.1 Introduction to Education and Outreach
The Education and Outreach work area explored the development of resources of electric vehicle knowledge, dissemination of that knowledge, training, and marketing. The education and outreach component of the plan was especially important because reaching target audiences in the community was found to be more effective at the community level as opposed to the individual municipalities or statewide. The Education and Outreach work area leveraged the work completed by the NC PEV Taskforce Education and Outreach Working Group to disseminate information to the community as a whole. The outreach efforts were tailored to each audience based on their specific needs and goals.

The Education and Outreach focus area covered four areas following the guidance of the U.S. Department of Energy for Electric Vehicle Readiness Planning, which included:

- Education of prospective PEV owners
- Outreach to interested groups
- Training of the PEV workforce (technicians, inspectors, charging station installers, etc.)
- Marketing of PEVs to skeptics and the undecided.\textsuperscript{13,14}

6.2 Existing Education and Outreach Initiatives

Existing Community Education and Outreach Activities

<table>
<thead>
<tr>
<th>Existing Initiatives</th>
<th>Power2Charlotte program</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Charlotte:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Partnering with Charlotte-area Chevrolet and Nissan dealerships to help educate electric vehicle owners and the public about the electric vehicle charging stations and electric vehicles. Promotion through dealership websites and providing information about charging stations</td>
</tr>
<tr>
<td></td>
<td>o Green Car guide available on website</td>
</tr>
<tr>
<td></td>
<td>o Current news updates on Charlotte EV infrastructure projects</td>
</tr>
</tbody>
</table>

\textsuperscript{13} Community Planning Guide for Plug in Electric Vehicles, Advanced Energy
\textsuperscript{14} U.S. Department of Energy, Sample Plan Outline for PEV Readiness
<table>
<thead>
<tr>
<th>Discovery Place</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Presented High School Electric Vehicle (EV) Challenge in DNC Legacy Village</td>
</tr>
<tr>
<td></td>
<td>Charging station powered by solar panel exhibit planned at museum parking deck</td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td>Schiele Museum &quot;Green Day&quot; Event</td>
</tr>
<tr>
<td></td>
<td>Charlotte Mecklenburg Gov't Center Earth Day</td>
</tr>
<tr>
<td></td>
<td>Ethanol Safety Seminar</td>
</tr>
<tr>
<td></td>
<td>Schiele Museum Earth Day</td>
</tr>
<tr>
<td></td>
<td>City of Charlotte Clean &amp; Green Earth Day</td>
</tr>
<tr>
<td></td>
<td>City of Charlotte Green Vehicle Display</td>
</tr>
<tr>
<td></td>
<td>UNC Charlotte Earth Day</td>
</tr>
<tr>
<td></td>
<td>Indian Trail Earth Day/Arbor Day</td>
</tr>
<tr>
<td></td>
<td>Drive Green Save Green Event</td>
</tr>
<tr>
<td></td>
<td>&quot;Compelling Case for NGVs&quot; Workshop</td>
</tr>
<tr>
<td></td>
<td>United Soybean Board/NC BEAN Biodiesel Workshop</td>
</tr>
<tr>
<td></td>
<td>Propane Education &amp; Research Council Presentation</td>
</tr>
<tr>
<td></td>
<td>Duke Energy PHEV Truck Media Event</td>
</tr>
<tr>
<td></td>
<td>United Soybean Board/NC BEAN Biobased Products Expo</td>
</tr>
<tr>
<td></td>
<td>Fill Good BP Customer Appreciation Event</td>
</tr>
<tr>
<td></td>
<td>NC American Planning Association Presentation on EVs</td>
</tr>
<tr>
<td></td>
<td>Ford Sustainability Luncheon</td>
</tr>
<tr>
<td></td>
<td>NC Air Awareness Luncheon</td>
</tr>
<tr>
<td></td>
<td>Fox News Charlotte Interview</td>
</tr>
<tr>
<td></td>
<td>NC PEV Taskforce Meeting - Raleigh, NC</td>
</tr>
<tr>
<td></td>
<td>Champions for Clean Air Award</td>
</tr>
<tr>
<td></td>
<td>Clean Cities Peer Exchange - Dallas, TX</td>
</tr>
<tr>
<td></td>
<td>Ford Power of Choice Event</td>
</tr>
<tr>
<td></td>
<td>EV Forum on Community Readiness - Mooresville, NC</td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Centralina Clean Fuels Coalition</td>
<td></td>
</tr>
<tr>
<td>Advanced Energy:</td>
<td>Trainings, Workshops, Public Outreach Events</td>
</tr>
<tr>
<td></td>
<td>o Community Planning Forums</td>
</tr>
<tr>
<td></td>
<td>o PEV 101</td>
</tr>
<tr>
<td></td>
<td>o First Responder Training</td>
</tr>
<tr>
<td></td>
<td>o Fleet Workshops</td>
</tr>
<tr>
<td></td>
<td>o Technical Trainings</td>
</tr>
<tr>
<td></td>
<td>Community Events</td>
</tr>
</tbody>
</table>
6.3 NC PEV Taskforce: Vehicles Working Group

**Members**

Most members of the NC PEV Taskforce volunteered to be a part of the Education & Outreach Working Group at the launch meeting on October 27, 2011. Several others joined the working group over the course of the successive months of plan input. The final member list is included within the NC PEV Roadmap.

**Goals**

The following goals were identified by the statewide NC PEV Taskforce Education & Outreach working group:

- Identify barriers and perceptions related to PEVs
- Identify target audiences for education and outreach
- Develop key messages to disseminated to each target audience
- Develop resources to aid in providing education and outreach
- Identify opportunities to create or support training related to PEVs
- Develop a plan for marketing PEVs in North Carolina

**Focus Areas**

The following focus areas were identified by the statewide NC PEV Taskforce Education & Outreach working group:

- The education and outreach working group focuses on education in general as established by DOE guidance
• The education and outreach working group focuses on outreach in general as established by DOE guidance
• The education and outreach working group focuses on training opportunities related to PEVs as established by DOE guidance
• The education and outreach working group focuses on marketing as established by DOE guidance

6.4 Greater Charlotte PEV Readiness Plan: Education and Outreach Work Area

In June 2011, the Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) published a Communications Strategy with the goal of presenting recommendations for mass communication and public information tactics and tools that fulfill the Centralina Clean Fuel Coalition’s objectives to:

➢ Accelerate and expand the use of PEVs
➢ Position CCFC as the regional leader in disseminating information to the 9-county area

Implementing this Communications Strategy will help address the identified need to raise awareness and educate the greater Charlotte region about PEVs.

The following outreach objectives emanate from and help fulfill the guiding concepts identified by the Greater Charlotte REVAC and other stakeholders in the 9-county area: to Educate, Prepare and Collaborate. The Communications Strategy outlines activities that will:

➢ Create awareness of readiness in the greater Charlotte region for the introduction of PEV technology
➢ Educate and define stakeholders’ roles in the introduction of PEVs to the region
➢ Increase knowledge among the community about their PEV options

Information Needs

Overcome obstacles among stakeholders
Regions face several obstacles, both perceived and real, in integrating PEVs into the mainstream. Municipalities, utilities and other stakeholders will need to develop new policies and procedures for infrastructure as well as address other potential barriers to market acceptance such as:

• non-uniform (or, varying) governmental permitting and codes
• preparedness of the electric grid
• availability of public charging stations

Increase knowledge among individuals
Consumers will seek and need vital information from local, state and federal government agencies, utility companies and automobile dealerships about this new generation of plug-in electric vehicles. Early adopters will likely be concerned about:
driving range of PEVs (range anxiety)
customer service issues (i.e., who to call for specifics)
high maintenance costs/and or availability of repair facilities (perceived or real)
availability of public charging stations/standardization of plugs
cost/permitting of home charging stations

Proposed Strategy

Develop and implement status as information hub
The CCFC will be positioned as the clearing house for local government agencies, utility companies, public and private fleets, automobile dealerships, private businesses, other organizations and educational institutions, and individuals in the greater Charlotte region.

- Initiate a website to serve as the regional cornerstone of the communication outreach efforts.
- Take action as the lead organization to find out and share information about the PEV technology and the status of current infrastructure (charging station sites) and other pertinent information.

Use marketing and outreach techniques
Establish top-of-mind awareness with a strong and repetitive presence in the market place using:

- **Consistent Branding** - Develop a brand/name for program/logo/tagline and call to action message
- **Launch Media Campaign** – Create concentrated one-month outreach effort
- **Maintain Presence** – Leverage partnerships to continue awareness and outreach efforts

Target Audiences
The communications plan is designed to reach these top six audiences important to fulfilling demand for information and providing next steps details to early adopters, decision-makers and other stakeholders.

1. Local government officials and staff
2. Entities with large vehicle fleets and/or large employers
3. Business owners (retail, services, parking lots, multi-family residential)
4. Organizations and institutions (trade associations, chambers, business districts, higher education)
5. Consumers (early adopters - high tech, environmentally sensitive, shorter commutes, high incomes two car garage)
6. Community-at-large
**Communications Tactics**

Based on the desire to launch communication strategies that fulfill CCFC’s goal of accelerating and expanding the use of plug-in electric vehicles (PEVs) and to create awareness, educate and define the roles of key stakeholders, and increase knowledge in the community about PEV options, the following communications tactics are recommended. The recommendations are divided into two phases, using paid, earned and social media, and planned to be implemented as financial resources are available.

- Phase I is a one to three-month concentration on creating awareness and brand recognition for the website and program.
- Phase II will build upon and expand the outreach of the website and information channels. Several of the following tactics will be implemented over a four to twelve week period, with more tactics being used as budget and time permits.

<table>
<thead>
<tr>
<th>Proposed Communications Tactics &amp; Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Months from Launch (Year One)</em></td>
</tr>
<tr>
<td>Phase I (Months 1 - 3)</td>
</tr>
<tr>
<td>Proposed Paid Media Tactics</td>
</tr>
<tr>
<td>Website with opt-in email newsletter list-builder tool</td>
</tr>
<tr>
<td>Print advertising in local newspapers and/or magazines including trade association magazines</td>
</tr>
<tr>
<td>Radio (traffic reports/community access channel, NPR, spot ads)</td>
</tr>
<tr>
<td>Media co-operative sponsorships</td>
</tr>
<tr>
<td>Electric vehicle branded with name of program/logo/web site</td>
</tr>
<tr>
<td>A launch event</td>
</tr>
<tr>
<td>Inserts/buck slips in stakeholders’ mailings</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td><strong>Email newsletter</strong></td>
</tr>
<tr>
<td><strong>Facebook page</strong></td>
</tr>
<tr>
<td><strong>Twitter</strong></td>
</tr>
</tbody>
</table>

**Phase II (Months 4 - 12)**

**Proposed Paid Media**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Month 4</th>
<th>Month 5</th>
<th>Month 6</th>
<th>Month 7</th>
<th>Month 8</th>
<th>Month 9</th>
<th>Month 10</th>
<th>Month 11</th>
<th>Month 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct mail – postcard campaign</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>₹</td>
<td>₹</td>
<td>₹</td>
<td>₹</td>
</tr>
<tr>
<td>Blog/regular website updates</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Video productions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>₹</td>
<td>₹</td>
</tr>
<tr>
<td>Co-operative advertising (with sponsors)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Professional PowerPoint outline for local presentations</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Internet ads</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Transit advertising</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>₹</td>
<td>₹</td>
<td>₹</td>
<td></td>
</tr>
<tr>
<td>Brochure/flyer – how and what to expect when owning an EV</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Proposed Earned Media**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Month 4</th>
<th>Month 5</th>
<th>Month 6</th>
<th>Month 7</th>
<th>Month 8</th>
<th>Month 9</th>
<th>Month 10</th>
<th>Month 11</th>
<th>Month 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain active email list to send press releases, links to other sites, blog</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>₹</td>
<td>₹</td>
</tr>
<tr>
<td>Create press worthy news and disseminate to media, especially “green media”</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>₹</td>
<td>₹</td>
<td>₹</td>
<td></td>
</tr>
<tr>
<td>Develop Facebook presence and get people to like</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>₹</td>
<td>₹</td>
</tr>
<tr>
<td>Link with sites such as the Community Environmental Council (CEC)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>₹</td>
<td>₹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop contest or events to draw people to Facebook, website and/or Twitter. Examples: free month of charging; free week of driving PEV (partner with utility or car dealership)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>₹</td>
<td>₹</td>
<td>₹</td>
<td></td>
</tr>
<tr>
<td>Leverage public relations – take advantage of green events and green media</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>₹</td>
<td>₹</td>
<td>₹</td>
<td></td>
</tr>
</tbody>
</table>
**Communication Messages**

A branded, consistent message and colorful, attractive logo will give the campaign a readily identifiable look and be easily remembered. Messaging will promote the following features and benefits of PEVs in the region, for launch, web site and continued outreach.

**Sample Messaging of Features:**
- The greater Charlotte region is prepared and ready for PEVs
- How local jurisdictions can get ready for PEVs
- Basic information on owning and operating PEVs
- Environmental benefits of using PEVs
- Links to obtain national information
- EVs compatibility with lifestyle
- Be a leader in the introduction of PEVs in the community
- How, where and cost to charge your PEV
- Education/retraining on PEV technology
- Encourage businesses to invest in PEVs

**Sample Messaging of Benefits:**
- PEVs and infrastructure are available now and/or soon in the area – number of charging stations, charging at home
- Use PEVs as second, commuter car for work trips, shopping, errands, doctor appointments, etc.
- Availability of governmental and private incentives
- Easy access to information - visit web site or call CCFC for all your answers
- Businesses – invest in charging stations/great employee benefit
- Savings calculations (cost savings, gas savings, and CO2 savings)
- Be labeled as a “green” organization
- Be part of the PEV movement

---

**Table 8:** Proposed Communications Tactics & Timetable included within REVAC Communications Plan.

<table>
<thead>
<tr>
<th>Proposed Social Media</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral videos</td>
<td>X</td>
</tr>
<tr>
<td>Link building campaign to attract more followers on Twitter and Facebook</td>
<td>X</td>
</tr>
</tbody>
</table>

![Table 8: Proposed Communications Tactics & Timetable](image-url)
Next Steps

- Select name, logo, tagline and web address for the PEV readiness efforts in the Greater Charlotte region.
- Build website for communications efforts
- Implement Phase 1 communications strategies
- Adapt and change messaging as PEV technology is adopted within the Centralina region and the public’s awareness and education increases.
- Begin implementing Phase 2 communications strategies early 2012.
- CCFC should look for additional resources and partnerships, especially with Duke Energy & the Duke Energy Foundation, to continue funding communication activities into the future.

The Regional Electric Vehicle Advisory Committee (REVAC) recommended expanding work included within the Communications Plan created by Centralina Clean Fuels Coalition in 2011 while meeting the following education and outreach goals:

Educate

- Create Training Courses for First Responders, Contractors, Mechanics, etc.
- Educated “Pre-K to Gray”
- Explore steps needed to add PEV issues into school curriculum
- Educate outside of school through public television, radio and other mediums
- Focus on imagination and creativity when engaging children
- Engage graduate students, especially local MBA programs
- Publish “New EV Owner Guide” that includes total cost-of-ownership information
- Integrate PEVs into Drivers Education Courses
- Gus the Bus version 2.0 PHEV

Collaborate

- Engage academic institutions through programs like S.T.E.M.
- Access PEV fleets for demonstration purposes
- Approach PEV manufacturers
- Support local dealerships
- Explore creative options for engagement such as the Mayors’ Youth Employment Collaborative
- Engage the private sector
6.5 Education and Outreach Events Completed as Part of the Greater Charlotte PEV Readiness Plan

As part of the NC PEV Readiness Initiative, the following Education and Outreach Events were held in the greater Charlotte region. The Mountains to Sea project was built around the Initiatives of the NC PEV Readiness programs led in North Carolina by Advanced Energy. Many of the events below were held as part of Advanced Energy’s program and aligned to meet the criteria and deliverables of the Mountains to Sea project. Some of the education and outreach events below were counted as cost share for the Mountains to Sea initiative.

**EV Challenge and the 2012 Democratic National Convention**

The 2012 Democratic National Convention was hosted in Charlotte, NC and due to the magnitude of the event, spanned well beyond the city’s limits and into a number of neighboring municipalities. Recognizing the opportunity to increase awareness surrounding PEVs, Centralina Clean Fuels Coalition chairman Dave Navey suggested that the coalition consider coordinating an outreach event. CCFC took this directive as endorsed by stakeholders and partnered with a number of organizations including the EV Challenge.

Since 1995, the EV Challenge has been providing a unique opportunity to engage high school students with a hands-on, real world solution to our transportation problems. The yearlong educational program features students that design, construct, operate, and educate the public about innovative full-size electric vehicles. In addition to building a street-legal electric vehicle, students compete in a series of events to determine the range and performance of their vehicle while demonstrating their public speaking, community outreach, and electric troubleshooting skills. The EV Challenge is a program of the nonprofit Carolina Electric Vehicle Coalition, Inc., based in Raleigh, NC. For more information visit: http://ev-challenge.org

Coordinated by Centralina Clean Fuels Coalition, Centralina COG and through sponsorship from Discovery Place, a partnership was established that allowed for an exhibit featuring the EV Challenge that would occur during the 2012 Democratic National Convention (DNC) Legacy Village Festival in Uptown Charlotte. The event supported the Discovery Place museum’s mission of providing extraordinary experiences that engage people in the active exploration of science and nature while expanding awareness of PEVs locally, regionally and due to the high-profile of the DNC, nationally as well.

CarolinaFest kicked off the 2012 DNC in Charlotte along with the four-day Legacy Village Festival. The Legacy Village highlighted community efforts to support City of Charlotte Mayor Foxx’s Legacy Projects. It was home to exciting and engaging exhibits and provided festival goers an opportunity to see firsthand the great work being done in support of the Mayor’s Legacies. The four convention Legacy Projects were:
Healthy Children, Healthy Families; Youth Employment and Civic Education; Building a Broader, More Inclusive Economy; and Energy, Technology, and Sustainability.

Located between the “Youth Employment & Civic Education” & “Energy, Technology, and Sustainability” sections of the Legacy Village Festival, the EV Challenge exhibit featured local high school students and faculty advisors from McMichael High School and Phillip O. Berry Academy as they converted a 1992 Ford Mustang to electric drive over the course of the four day festival. Upon completion, the fully converted, street-legal car was driven to Discovery Place and plugged in to the museum’s solar powered charging station.

Figure 41: Local High School students from Philip O. Berry Academy are interviewed about their experience after the EV Challenge exhibit closes at the 2012 Democratic National Convention in Charlotte, NC.

LIVE Image: This image is hyperlinked to CCFC’s Online Vimeo web-page. To watch the video, simply click the image if viewing this document in electronic form, otherwise, please visit: http://vimeo.com/49417888

The exhibit garnered interest from hundreds of event attendees including delegates, elected officials, policy advocates and members of the general public. Media coverage included a number of entities such as the Charlotte Observer which quoted Philip O. Berry student senior Ayanna Wofford as saying “It was a great learning experience, because I never considered engineering”. City of Charlotte Mayor Anthony Foxx recognized the achievement of the students during a pre-recorded video address to members of the NC PEV Taskforce that was used to welcome stakeholders to Charlotte during the coalition’s quarterly meeting on September 19, 2012 at the Charlotte Convention Center.

Figure 42: Ampmobile Conversions aids the conversion of a 1992 Ford Mustang to electric drive in just four days.
Planning for the exhibit was supported by Advanced Energy, Ampmobile Conversions, the North Carolina Plug-In Electric Vehicle (PEV) Taskforce, NC State University and the Advanced Transportation Energy Center (ATEC), and media partner WBTV-CBS. The exhibit would not have been possible without McMichael High School and Phillip O. Berry Academy whose faculty advisors. Centralina Clean Fuels Coalition and Discovery Place are continuing work to ensure that the legacy of the exhibit at the 2012 Democratic National Convention is realized by facilitating the partnership established during the event to bring the traditional EV Challenge to local high school curriculum across the 9-county greater Charlotte region.

**First Responder Trainings**
First Responders from the greater Charlotte region received training for emergencies involving PEVs at the Conover Fire Department on November 20, 2012. This training was part of a series of hands-on trainings being offered statewide through North Carolina’s Community Colleges. The event was sponsored by Wilson Community College, Catawba Valley Community College, Duke Energy and Advanced Energy.

**Technical Forums**
A free workshop focused on code requirements, design recommendations, and local examples of charging stations for plug-in electric vehicles as hosted by Advanced Energy in Concord, NC on July 17, 2012. A number of code enforcement professionals, electrical contractors and other interested attendees participated in the event making it the most well attended technical forum held by Advanced Energy in 2012.

![Figure 43: PEV Technical Training- Code and Permitting in Concord, NC](http://vimeo.com/45990526)

**Ride and Drive Events**
Centralina Council of Governments hosted Ride and Drive events in partnership with CODA Automotive and Ford Motor Company.
Centralina Regional Plug-in Electric Vehicle Awareness Week

The greater Charlotte region celebrated its first Electric Vehicle Week along with the greater Asheville, Piedmont-Triad and Research Triangle regions of North Carolina beginning Monday, Sept. 17, 2012. Events culminated on Sunday, September 23, when the region joined more than 50 cities and towns across the country in celebrating National Plug-In Day 2012.

The Events Included:

- **Monday, Sept. 17, 2012** – *Hybrid Truck Users Forum (HTUF), Charlotte Convention Center*
  (501 South College St., Charlotte)
  *Conference and Ride-N-Drive at zMax Dragstrip on Thursday, Sept. 20*

  HTUF 2012 marks the 12th year of the nation’s premier event for advanced technologies in the medium and heavy-duty industries. The Hybrid, Electric, and Advanced Truck Users Forum National Conference and Expo focused on educating, training, supporting and guiding the next generation of end-users. HTUF 2012 featured:
  - A two day, user-focused agenda
  - Over 50,000 sq. feet of technology exhibits and vehicle displays
  - The world’s largest medium and heavy-duty Ride and Drive
  - Gala Reception at the NASCAR Hall of Fame

- **Tuesday, Sept. 18, 2012** – *Revenge of the Electric Car’ at Epi-Centre Theaters*
  (210 East Trade St., Charlotte)
  - Pre-Screening Party at the Mez Lounge
  - FREE Screening of ‘Revenge of the Electric Car’
  - Panel discussion with industry experts

  In Revenge of the Electric Car, director Chris Paine takes his film crew behind the closed doors of Nissan, GM, and the Silicon Valley start-up Tesla Motors to chronicle the story of the global resurgence of electric cars. Without using a single drop of foreign oil, this new generation of car is America’s future: fast, furious, and cleaner than ever.

- **Wednesday, Sept. 19, 2012** – *NC PEV Taskforce at the Charlotte Convention Center*
  (501 South College St., Charlotte)
  - NC PEV Taskforce Quarterly Meeting
North Carolina’s Road to Successful Plug-in Electric Vehicle Adoption: Is Your Community Ready? Come find out! Join the NC PEV Taskforce to learn about NC’s first statewide and Community PEV Readiness Plans. Hear from stakeholders in the Charlotte, Asheville, Piedmont Triad and Triangle to learn about ongoing initiatives for the future of PEVs in North Carolina.

➤ Thursday, Sept. 20, 2012 – Plug-in Electric Vehicle Industry Roundtable at DesignLine Corp (2309 Nevada Blvd., Charlotte)
Organized by the NC Department of Commerce and NC Solar Center / NC State University, the PEV Industry Roundtable was the second meeting of PEV industry leaders in North Carolina that has resulted from the NC PEV Readiness Initiative: Plugging In from Mountains to Sea. The events provided opportunities to network and strategize with other PEV industry related leaders in North Carolina.

National Plug-In Day is an unprecedented nationwide observance drawing global attention to the environmental, economic and other benefits of plug-in electric vehicles through simultaneous events staged in at least 20 major cities nationwide. Plug-In America, the Sierra Club, and the Electric Auto Association teamed up to plan for this effort, which sounded the bell through plug-in parades, tailpipe-free tailgate parties, test-drives and other grassroots activities in over 50 cities and towns across the country.

6.6 Conclusions
A number of partnerships have been established through the PEV readiness planning work done in the greater Charlotte area that have proven successful in expanding the awareness of PEVs and charging infrastructure. Centralina Clean Fuels Coalition will continue to improve the education and outreach activities associated with these partnerships while following guidance as outlined in the Regional Electric Vehicle Advisory Committee Communications Strategy.
6.7 Recommendations

Key educations and outreach strategies for PEV readiness in the Greater Charlotte Region are detailed in the table below:

<table>
<thead>
<tr>
<th>Table 9. Recommendations from the Education &amp; Outreach Work Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommendation</strong></td>
</tr>
<tr>
<td>4.1 Work with local schools to incorporate PEV considerations into their curriculum</td>
</tr>
<tr>
<td>4.2 Work with local community colleges and universities</td>
</tr>
<tr>
<td>4.3 Media Outlets</td>
</tr>
<tr>
<td>4.4 Events and Conferences</td>
</tr>
<tr>
<td>4.5 Informational Documents</td>
</tr>
<tr>
<td>4.6 Collaboration with stakeholders</td>
</tr>
</tbody>
</table>

*Term Lengths for Recommendations

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>1 to 2 years</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>3 to 5 years</td>
</tr>
<tr>
<td>Long-Term</td>
<td>6 to 10 years</td>
</tr>
<tr>
<td>On-going</td>
<td>No set start or end time</td>
</tr>
</tbody>
</table>

**Priority Levels for Recommendations

<table>
<thead>
<tr>
<th>Priority Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
</table>
7 ECONOMIC DEVELOPMENT

7.1 Local Economic Development Considerations for Plug-in Electric Vehicles (PEVs)

Policies, Codes and Standards can either effectively provide guidance or unnecessarily constrain the adoption of electric vehicles in the Charlotte area. If codes are updated to allow for the seamless integration of PEVs in the region, they will allow for the exiting PEV industry to flourish. An industry count of plug in electric vehicles conducted by the NC PEV Taskforces Incentives and Economic Development workgroup found that there are 15 Plug in Electric Vehicle industries\(^\text{15}\) that operate already in the 9-county Charlotte area, plus there are secondary positions that work with the installations such as plan designers, installers.

Local Champion

The following individual served as a local champion for the economic development working area:

- Mr. Michael Manis – Centralina Community & Economic Development

The New Energy Capital

Charlotte’s New Energy Capital initiative is working to leverage the region’s burgeoning energy cluster to attract even more energy businesses. With the nation’s largest utility and the country’s number two banking center based in the City of Charlotte, conditions are ripe for the PEV industry.

As of August 2012, the Greater Charlotte Region was home to more than 250 businesses directly tied to the energy sector. Employing over 30,000 workers, the sector is the third largest industry in the region and has created over 5,300 local jobs since 2007.

In addition to these advantages, the academic institutions in the 9-county area also provide workforce development training and resources both to future and current employees of the energy industry. The state’s community colleges are working closely with Duke Energy, Siemens and others to provide skills specific to this growing field. This level of investment can translate into additional support for PEV specific industry growth.

Job Growth

In the fall of 2012 a study was released out of Germany that examines employment prospects within the automotive sector, devoting special attention to the emergence of alternatives including PEVs. The study finds that jobs will not only be created in research and development, but also manufacturing. Overall, the study concludes, there will be transformative changes occurring within the automotive value chain.

\(^{15}\) NC PEV Roadmap, Incentives and Economic Development Chapter
**Local Case Study**

More than 250 people attended the June 29, 2012 grand opening of Rockwood Lithium’s $75 million Global Technical Center and Production Facilities for Advanced Lithium Materials in Kings Mountains, NC. Company officials said the facilities will power the electric car industry and reduce dependence on foreign oil. Austin Devaney, global product manager for Battery Technologies and NC PEV Taskforce stakeholder spoke with members of the Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) about how the expansion will create more than 100 new jobs in the 9-county region as lithium hydroxide is used to create batteries for electric cars such as the Chevrolet Volt, Nissan Leaf and Ford Focus, all of which are available for purchase in North Carolina.

“The Kings Mountain facility expansion exemplifies American manufacturing leadership and technical expertise in clean energy technologies – helping to strengthen our nation’s energy security and create new jobs. With support from the Energy Department, this project will make America more competitive in a range of new technologies and will help ensure the United States leads once again in manufacturing the next generation of clean energy and advanced vehicle technologies.”

- U.S. Department of Energy Secretary Steven Chu

Our dependence on oil as the only fuel available to drive our cars is a clear and present danger to the economic stability and national security of the United States. By driving electric cars, we end for good our dependence on oil. The electric cars are not a dream; they are available.”

- Chairman & CEO of Rockwood Holdings, Inc., Seifi Ghasemi

"The expansion of Rockwood will not only allow the company to upgrade the production of lithium materials but it will put talented scientists, engineers, and production personnel to work here in North Carolina.”

- U.S. Senator Kay Hagan

“Eventually, the expectation is that as car batteries evolve, lithium foil will be used in fourth-generation electric cars... We’re always looking ahead.”

- Battery Supervisor at King’s Mountain Facility, John Sattizahn
NC Tomorrow

The North Carolina Association of Regional Councils is leading a collaborative partnership with assistance from the US Economic Development Administration, North Carolina Department of Commerce -Division of Community Development, the US Department of Housing & Urban Development and the SAS Institute of Cary, NC to create a statewide Strategy for Comprehensive Economic Development for North Carolina.

The first initiative has conducted uniform Regional Comprehensive Economic Development Strategies (CEDS) across North Carolina. These regionally significant CEDS will then serve as the foundation to create the NC Strategy for Comprehensive Economic Development (SCED) that can serve as a statewide blueprint for creating an economically sustainable economy for North Carolina.

The Centralina Economic Development Commission (CEDC) has initiated the five-year update of its existing “CEDS”. This strategic plan outlines the nine-county region’s approach to growing jobs and the economy. It builds on regional strengths, emphasizes key regional industry clusters and prioritizes economic development projects. Having a collaborative economic development strategic plan helps our communities compete for businesses and people, both nationally and internationally. The CEDS covers a number of target industries, competencies and aspirational targets specific to the Greater Charlotte 9-county region that work to support PEVs and charging infrastructure.

Table 10: Centralina COG: Economic Strategic Assessment for the Greater Charlotte Region (December 2012)
7.2 Conclusions
The Regional Electric Vehicle Advisory Committee discussions revealed many of the most impactful incentive options would come from the Statewide Working Group for Incentives and Economic Development, however, the group identified several local incentive options which may help to boost PEV adoption in the greater Charlotte area.

To reference the recommendations for state and federal level incentives, please visit the North Carolina PEV Roadmap which contains the incentives research and recommendations from the NC PEV Taskforce, Incentives and Economic Development Working Group.

7.3 Recommendations
Key economic development strategies for PEV readiness in the Greater Charlotte Region are detailed in the table below:

| Table 11. Recommendations from the Economic Development Working Area |
|-----------------|------------------|----------------|------------------|
| **Recommendation** | **Time Frame** | **Priority Level** | **Responsible Parties** |
| 5.1 | Explore workplace charging districts | Medium-Term | High | Local Government or regional non-profit |
| 5.2 | Identify and connect local businesses interested in installing charging infrastructure | On-going | High | CCFC, NCPEVTF |
| 5.3 | Update Chambers of Commerce and Economic Development Commissions on PEV Readiness | On-going | High | CCFC, NCPEVTF |
| 5.4 | “Making the Business Case” Informational Documents | On-going | High | Local Government, Statewide or regional non-profit |
| 5.5 | Industry Collaboration | On-going | High | State Government or regional non-profit |
**Term Lengths for Recommendations**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>1 to 2 years</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>3 to 5 years</td>
</tr>
<tr>
<td>Long-Term</td>
<td>6 to 10 years</td>
</tr>
<tr>
<td>On-going</td>
<td>No set start or end time</td>
</tr>
</tbody>
</table>

**Priority Levels for Recommendations**

<table>
<thead>
<tr>
<th>Priority Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
</table>
8 INCENTIVES

8.1 Introduction to Incentives for Plug-in Electric Vehicles (PEVs)

Economic, air quality, and security concerns at the national level certainly have impacts at the local level. The greater Charlotte region is not isolated from national concerns as the transportation system reflects the national model for moving people, goods, and services. Uncoupling our local economy from petroleum is as important as moving our national economy away from oil. National leadership is supporting a move to domestically sourced alternative fuels, as are Charlotte community leaders.

The Charlotte region must comply with emission reduction standards for both health, environmental, and economic development concerns. Electric generation is increasingly emission free. Solar, wind, nuclear, and hydro-electric are examples of this technology. Natural gas generation offers substantially reduced emissions compared to fossil fuels and is domestically abundant. Higher emission coal-fired powered plants are being replaced by lower cost natural gas plants and remaining coal fired power plants are becoming cleaner over time.

Given the importance and public good offered by adopting PEVs across the 9-county Charlotte area, utilizing incentives is an important way to support the level of early adoption necessary to make PEVs a common consumer choice. The Incentives work area covered efforts to define and evaluate various benefits that could be provided to encourage community members to become PEV owners and drivers. Stakeholders interested in the area of incentives and economic development assessed existing incentives and economic development opportunities and worked to develop a plan to communicate the available or anticipated benefits of these incentives for PEV owners and industry.

Why are incentives needed?

Parity with Internal Combustion Engines (ICE) vehicles can best be described as the point at which electric motor efficiency battery cost and battery energy density intersect with ICE efficiency and petroleum costs. In other words, at what point does electricity, battery and electric motor costs equal the ICE and fuel prices. We are getting close. Reducing battery costs and increasing battery energy intensity are two arenas ripe for research and development. Development of these technologies maintain further potential for reducing costs to the point that PEVs will exceed ICE powered transportation in every aspect. This opens opportunities for research and development of the next and following generations of battery technology as well as establishing manufacturing jobs supplying the automobile industry with next generation components.
Consider that PEVs are new technology on a familiar platform. The essentials of the automobile we have known and become captivated by still exist in the PEV. Highways remain the pathway to destinations of choice, and PEVs look like and drive like their ICE counterparts. Most of our motoring public are unconcerned about how the vehicle works and probably have no desire to learn the difference between a dip-stick and a kilowatt hour. So, why are we seeking incentives to achieve parity between ICE and PEVs, and how does this road to parity lead to economic development?

### 8.2 Existing Incentives in the Greater Charlotte Region

#### Local Incentives for PEVs

The Charlotte area is recognized nationally for its adoption of PEVs. Part of this early adoption can be attributed to the local incentives and programs. Below are some examples local incentives:

<table>
<thead>
<tr>
<th><strong>Existing Incentives</strong></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Charging</td>
<td>Many of the public charging stations are offering free charging of electric vehicles for the first few years. And workplace charging.</td>
</tr>
<tr>
<td>Preferred Parking</td>
<td>Many of the public charging stations offer ideal parking locations for destinations, such as key spots in downtown locations, and close locations to destinations.</td>
</tr>
<tr>
<td>Employer Incentives</td>
<td>Some large employers in the region, such as Bank of America and others are offering rebates to customers who purchase an electric vehicle.</td>
</tr>
<tr>
<td>Expedited Permitting</td>
<td>The Mecklenburg County Permitting Office has improved their Trade Internet Permitting (TIP) System to allow contractors the ability to achieve an EVSE permit in about 20 minutes</td>
</tr>
<tr>
<td>Reduced Interest Rates</td>
<td>The NC based State Employees Credit Union in an effort to encourage reduced emissions vehicles, offers a reduced interest rate loan for vehicles.</td>
</tr>
</tbody>
</table>
8.3 NC PEV Taskforce: Incentives and Economic Development Working Group

The Incentives and Economic Development Work Group (IEDWG) included representatives from industry, utilities, city and state government, non-profits, and interested private citizens. One NC elected official, State Representative Joe Tolson participated in meetings and expressed support for the working group efforts. The IEDWG met seven times between January and September 2012 with individual meeting participation ranging from 15 to 26 attendees. The IEDWG was co-lead by the NC Solar Center/NC State University and the NC Department of Commerce with meetings held at the NC Solar Center offices at NC State University.

Goals

The IEDWG goal was to access best practices in the realm of PEV related incentives and develop recommendations to position North Carolina as advantageously as possible for widespread Plug-In Electric Vehicle (PEV) adoption. An overarching goal is to encourage business development to grow North Carolina’s green economy with PEV related industries.

Tasks

- Survey of NC fleet related personnel about potential incentives
- Develop list of PEV industry contacts in North Carolina
- Analysis of incentives of PEV adoption in other states
- Potential policy language to support PEV expansion
- Facilitation of prioritized portfolio of incentives
- Maps of PEV Industry in North Carolina
- Provide guest presentations relevant to PEV industry expansion

8.4 Greater Charlotte Region: Incentives Work Area

Content Experts

Significant contributions were made by several local experts to direct the work of the Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) in exploring the incentives topic area. Representatives from economic development organizations, local dealerships and utilities provided expert perspectives on the obstacles and opportunities regarding the impact of incentives to PEV adoption in the greater 9-county Charlotte area.

Local Champions

The following individual served as local champion for the vehicles working area:

- Ms. Kristy Crisp – City of Gastonia
Focus Areas
The Greater Charlotte Regional Electric Vehicle Advisory Committee (REVAC) considered the following goals related to incentives:

- Identification of local incentives;
- Discussion of effective potential incentives (monetary and non-monetary); and
- Pass along recommendations to the statewide Incentives Working Group.

8.5 Local Incentives
For the most part, local stakeholders relied on recommendations from the NC Solar Center and those leading the statewide Incentives Working Group to determine what types of incentives should be considered on both the state and local level. Members of REVAC considered the following guidance:

Who Can Offer Local Incentives?
- Employers
- Lenders
- Utilities
- Local Governments
- Local Vehicle Dealers
- Local Businesses/Retail/Parking Facilities/Entertainment Venues
- Others

Monetary vs. Non-monetary Incentives
The following are some examples of Monetary Incentives. For the purpose of the Greater Charlotte PEV Plan, members of REVAC focused on local monetary incentives and deferred the state and national incentive discussion to the NC PEV Taskforce’s Incentives and Economic Development Working Group. Please refer to the NC PEV Roadmap for more information regarding state and local incentives.

Examples of Monetary Incentives:
- Rebates or tax credits (state)
- Rebates or tax credits for charging infrastructure
- Waived license fees (may cause resentment with ICE drivers)
- State sales tax
- Emissions testing fees
- Free or reduced tolls
- Low interest rate loans
- Free public charging
The following are some examples of Non-Monetary Incentives. For the purpose of the Greater Charlotte PEV Plan, members of REVAC focused on local non-monetary incentives and deferred the state and national incentive discussion to the NC PEV Taskforce’s Incentives and Economic Development Working Group. Please refer to the NC PEV Roadmap for more information regarding state and local incentives.

Examples of Non-Monetary Incentives:

- HOV lane access (already approved)
- Workplace charging
- Preferred dedicated parking
- Expedited permitting
- Codes - encourage new construction to install dedicated circuits for EVSE installations

Public Charging Station Incentives

The notion of range anxiety is noted as the potential buyer’s first hurdle to overcome when considering the purchase of a PEV. Publicly available charging stations are very effective for providing “fuel security”. Data shows that PEV owners quickly adjust and presumably lose their anxiety.

Local dealerships indicated that maps of publicly available charging stations are commonly used when speaking with potential PEV adopters. Centralina Clean Fuels Coalition’s REVAC is exploring ways to provide customized EVSE maps for local dealerships that would be part of a larger support package.

Other options discussed include:

- “Friends of PEVs” program: Recognize local businesses that provide PEV charging to patrons. A similar model is used by the local biofuel organizations that recognize local restaurants who sell their used grease for biofuel usage.
- Free “Valet” parking: Lexus dealerships provide free valet services for Lexus drivers at area shopping centers. This concept could be added for electric vehicles.
- Free parking for large events such as local sporting events. A suggestion would be to have the car companies sponsor the free parking.
- Reserved Parking: Several PEV insist that they do not need or desire premier parking. However, the enforcement of “PEV only” parking for charging locations is important for drives of PEVs. Potential PEV drivers will also need the security of knowing that charging station spaces are reserved only for Plug-in Electric Vehicles.
Avoiding Resentment Among ICE Drivers

Members of REVAC considered incentive options such as waiving or reducing automotive license fees, gasoline sales taxes and other taxes. The consensus was that this could create resentment among ICE drivers. Additionally, these fees are used for various components such as road maintenance, so those incentives are not sustainable options.

Local Economic Development Opportunities

Locally adopted incentives can tie into economic development in the Charlotte region. For example, incentives offered by local employers are making a statement about the type of workforce they are trying to attract and will continue to encourage workers locate in the region. In fact incentives and economic development have such a strong tie that the NC PEV Taskforce Working Groups for Incentives and Economic Development were tied together into a joint working group.

8.6 Conclusions

The Regional Electric Vehicle Advisory Committee discussions revealed many of the most impactful incentive options would come from the Statewide Working Group for Incentives and Economic Development, however, the group identified several local incentive options which may help to boost PEV adoption in the greater Charlotte area.

To reference the recommendations for state and federal level incentives, please visit the North Carolina PEV Roadmap which contains the incentives research and recommendations from the NC PEV Taskforce, Incentives and Economic Development Working Group.

8.7 Recommendations

Key recommendations surrounding incentives can be found in the table below:

<table>
<thead>
<tr>
<th>Table 12. Recommendations from the Incentives Working Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendation</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>6.1. Encourage local partners to develop incentives</td>
</tr>
<tr>
<td>(monetary and non-monetary)</td>
</tr>
<tr>
<td>6.2. Work through local partners to communicate</td>
</tr>
<tr>
<td>available incentives</td>
</tr>
</tbody>
</table>

...
6.3 | Support recommendations of statewide readiness plan | Short-Term | High | CCFC, NCPEVTF

---

**Term Lengths for Recommendations**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>1 to 2 years</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>3 to 5 years</td>
</tr>
<tr>
<td>Long-Term</td>
<td>6 to 10 years</td>
</tr>
<tr>
<td>On-going</td>
<td>No set start or end time</td>
</tr>
</tbody>
</table>

**Priority Levels for Recommendations**

<table>
<thead>
<tr>
<th>Priority Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
</table>
9 ELECTRIC UTILITIES

9.1 Overview of North Carolina

North Carolina’s electric utilities include the electric power holding companies such as Duke Energy and Dominion, as well as electric cooperatives and municipally owned utilities. Each of the utilities is engaging in various plug-in electric vehicle readiness activities to help better prepare their operations and the electric rate payers for the adoption of plug-in electric vehicles.

Types of Utilities

The following list outlines the types of electric utilities in North Carolina. A description of utilities serving the 9-county Greater Charlotte Region can be referenced in Section 9.2. Additional information is available within the NC PEV Roadmap: www.ncpevtaskforce.org.

<table>
<thead>
<tr>
<th>Investor Owned Utility (IOU): “a utility company owned and operated by private investors as opposed to ownership by a governmental agency or member-customers” [for-profit]</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are two (2) investor-owned utilities (IOUs) in North Carolina:</td>
</tr>
<tr>
<td>• Duke Energy, which includes Duke Energy Carolinas and Progress Energy Carolinas</td>
</tr>
<tr>
<td>• Dominion NC Power</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cooperative: “a non-profit utility owned by its members”</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina has 31 Electric Membership Corporations (EMCs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Muni: “a municipal power agency; while some munis [municipalities] generate their own power, most purchase it wholesale from a larger utility.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina has 74 Municipal and University-owned Electric Distribution Systems</td>
</tr>
</tbody>
</table>

North Carolina generates its electricity from a mix of energy sources primarily including coal and nuclear with smaller amounts of hydroelectric, natural gas and other sources such as solar, wind and biomass. As the use of renewable sources of energy increases, the reliance on sources such as coal has been decreasing over time. The U.S. Energy Information Administration indicates in the State Electricity Profile for North Carolina, released in January 2012, reports that North Carolina has decreased its use of coal as an energy source from 58.7% in 2000 to 53.8% in 2010. 19

---

16 Public Utilities Reports Inc. Guide, 2004
17 Public Utilities Reports Inc. Guide, 2004
18 Public Utilities Reports Inc. Guide, 2004
The Union of Concerned Scientist, in a report released in 2012, indicates that the benefits of electric vehicles are linked to the electricity grid and concludes that as the national sales of electric vehicles increase, this should also be accompanied by a shift to cleaner sources of energy in order to balance the impact of emissions.\(^{20}\)

North Carolina benefits from both policy and market driven initiatives that aim to increase the use of renewable sources of energy. In 2007, North Carolina became the first state in the Southeast to adopt a Renewable Energy and Energy Efficiency Portfolio Standard (REPS), which requires that electric utilities obtain a portion of their energy through renewable energy resources or energy efficiency measures.\(^{21}\)

In a market driven initiative, electric utility customers have the ability to help mitigate greenhouse gas emissions by purchasing renewable energy via NC GreenPower, an independent nonprofit organization established by the NC Utilities Commission. NC GreenPower supports electrical generation from renewable energy sources such as solar, wind, and organic matter.\(^{22}\) For more information on PEV adopters offsetting the energy usage by contributing to NC GreenPower, visit Chapter 4 Vehicles of this plan.

---


\(^{21}\) [http://www.commerce.state.nc.us/reps/reps.htm](http://www.commerce.state.nc.us/reps/reps.htm)

\(^{22}\) NC GreenPower Website, [http://www.ncgreenpower.org/about/](http://www.ncgreenpower.org/about/)
9.2 Description of North Carolina’s Electric Utilities

The North Carolina Electric utilities and associations have all participated in collaborative PEV readiness initiatives such as the NC PEV Taskforce and the U.S. Department of Energy’s PEV Planning grant in NC, “Plugging-in from Mountains to Sea”. Each utility and utility association has submitted a description of their operations for this plan.

Duke Energy
(Information provided by Duke Energy)

Duke Energy is the largest electric power holding company in the United States with more than $100 billion in total assets. Its regulated utility operations serve approximately 7.1 million electric customers located in six states in the Southeast and Midwest. Its commercial power and international business segments own and operate diverse power generation assets in North America and Latin America, including a growing portfolio of renewable energy assets in the United States. Headquartered in Charlotte, N.C., Duke Energy is a Fortune 250 company traded on the New York Stock Exchange under the symbol DUK. More information about the company is available at: www.duke-energy.com.

Duke Energy Carolinas

Duke Energy Carolinas owns nuclear, coal-fired, natural gas and hydroelectric generation. That diverse fuel mix provides approximately 19,500 megawatts of owned electric capacity to approximately 2.4 million customers in a 24,000-square-mile service area of North Carolina and South Carolina.

Progress Energy Carolinas

Progress Energy Carolinas, a subsidiary of Duke Energy (NYSE: DUK), provides electricity and related services to nearly 1.5 million customers in North Carolina and South Carolina. The company is headquartered in Raleigh, N.C., and serves a territory encompassing more than 34,000 square miles including the cities of Raleigh, Wilmington and Asheville in North Carolina and Florence and Sumter in South Carolina. More information is available at www.progress-energy.com.
**Dominion**
*(Information provided by Dominion)*

Dominion is one of the nation’s largest producers and transporters of energy, with a portfolio of approximately 27,400 megawatts of generation, 12,000 miles of natural gas transmission, gathering and storage pipeline and 6,300 miles of electric transmission lines. Dominion serves energy customers in 15 states with over 2.4 million electric customers in VA and NC, 1.3 million natural gas customers in OH & WV and 2.0 million non-regulated retail customers in 12 states.

**ElectriCities**
*(Information provided by ElectriCities)*

ElectriCities provides customer service and safety training, emergency and technical assistance, communications, government affairs and legal services to 70 municipal electric systems in the state of North Carolina. Through consolidation of these services, members save their customers the expense of administering these functions locally.

**North Carolina’s Electric Cooperatives**
*(Information provided by NC Electric Cooperatives)*

North Carolina’s electric cooperatives serve more than 2.5 million people across North Carolina in 93 of the state’s 100 counties. The 26 electric cooperatives are private, independent and not-for-profit entities committed to providing a high standard of service to residential, commercial, industrial and agricultural customers with at-cost electric service. Each of North Carolina’s electric cooperatives is governed by a board of directors elected from its membership. Members are also owners. North Carolina’s electric cooperatives emphasize the importance of community involvement, integrity, accountability and innovation.

**9.3 Utility PEV Readiness Matrix**

Advanced Energy Corporation worked with utilities in North Carolina as part of the NC Plug-In Electric Vehicle Initiative: Plugging In from Mountains to Sea (M2S) that are involved in various activities to prepare their services and customers for plug-in electric vehicle adoption. The NC PEV Roadmap includes the Utility PEV Readiness Matrix that captures the various readiness efforts of the utilities.

**9.4 Public Utilities PEV Readiness Programs and Activities**

In addition to those items listed in the Utility PEV Readiness Matrix, North Carolina electric utilities are each involved in a variety of studies, programs, and other initiatives designed to help prepare both the utilities and the residents in the Greater Charlotte Region for plug-in electric vehicles. This section contains a sample of the readiness activities undertaken utility partners within the greater Charlotte 9-county region:
Duke Energy

Information provided by Duke Energy Carolinas. The information contained in this document pertains to Legacy Duke Energy Carolinas and should not be interpreted or presented as information from the combined company.

Duke Energy Carolinas is currently participating in pilots to collect data that will enable us to learn about grid impacts, better understand customer charging behavior, and potentially develop PEV-related products that will appeal to PEV owning customers.

GM Chevy Volt EV Field Test

The purpose of the General Motors (GM) Volt Deployment Project is to evaluate the technical performance, system impacts, and user preferences associated with electric vehicle charging during normal usage of extended range electric vehicles (EREV). Technical attributes to be tested include impacts on distribution-level power delivery equipment, power quality impacts, and interoperability with customer-sited energy management systems. To achieve these objectives, Duke Energy purchased 16 Chevy Volts. Ten of these Volts were issued to Duke Energy employees with diverse commuter profiles and in some cases previously installed home energy management equipment and the other six vehicles were distributed as part of fleet pool vehicles. In addition, charging stations and necessary monitoring equipment were installed as needed to support EREV usage and collect data in accordance with the test plan.

The results of the project will be primarily technical aspects of EREV usage. These results will be made available to other business units to help project the impacts of future electric vehicle adoption.

In addition to the objectives of this project, tests will be conducted to meet the requirements of DOE Recovery Act Statement of Work (DE-FOA-0000028) which establishes information sharing requirements and some operational requirements related to EREV usage.

Charge Carolinas Project

This is an EV infrastructure pilot designed for Duke Energy to learn about residential customer charging behavior and test residential offers. The project involves 150 Duke Energy residential customers and 150 Duke Energy owned intelligent charging stations in North and South Carolina. A total of 121 customer participants are located throughout Duke Energy’s North Carolina service territory with 51 participants in the Greater Charlotte Region.
**Envision Energy Project**

Another significant effort in North Carolina involving PEVs is Envision Energy Project located in the McAlpine Creek neighborhood in Charlotte, NC. McAlpine Creek is a Duke Energy test site for new technology. Residents and businesses in the area are testing a variety of components for Duke Energy, including solar panels, digital smart meters, battery storage, electric vehicles and home energy management systems. Putting the technology to use within the neighborhood allows Duke Energy to assess how various technologies may work on a much broader scale in the future. It allows us to see understand how these technologies interact with each other, how they will integrate with the power grid, and what the customer experience will be like. The McAlpine substation serves almost 17,000 residential and commercial customers.

**Progress Energy Carolinas**


Progress Energy Carolinas is actively engaged in a range of activities related to the research and demonstration of plug-in electric vehicles (PEVs) and related charging infrastructure. The information gathered from this work will enable us to learn about grid impacts, better understand customer charging behavior and needs, and potentially develop PEV-related products that will appeal to PEV customers.

**GM Chevy Volt demonstration**

Progress Energy Carolinas is a utility partner in a grant awarded to General Motors under the American Recovery and Reinvestment Act. The automaker is utilizing the funding to help develop, demonstrate and deploy its Chevy Volt extended-range electric vehicle. Progress Energy is participating by demonstrating 12 early production Chevrolet Volts, five of which are deployed in the North Carolina territory. This expands our existing partnership and our knowledge of the technology. The vehicles join a national GM demonstration fleet of Volts with enhanced data logging capability to better understand vehicle performance and charging behavior. In addition, Progress Energy Carolinas will be completing a technology evaluation of demand response via OnStar, as well as facilitating additional research on DC fast charging and large-scale PEV charge management.
**Plugged-In Carolinas project**

This is an EV charging infrastructure research project designed for Progress Energy Carolinas to learn about residential and public access electric vehicle charging infrastructure and charging behavior. This project is targeting the deployment of approximately 150 residential and 50 commercial, publically accessible smart charging stations with Progress Energy Carolinas customers in North and South Carolina. Data collected from the stations will help us to evaluate charging needs outside the home, impact on the grid and the costs and issues associated with installing public-access charging stations. These insights will help us as we continue to prepare for the large-scale adoption of plug-in vehicles.

**Plug-in vehicle community readiness planning**

Progress Energy Carolinas has collaborated with Advanced Energy since 2009 to assist with plug-in vehicle community readiness efforts and to partially fund the development and delivery of PEV-related training courses throughout the state.

**Plug-in vehicle fleet**

Progress Energy, through its Carolinas and Florida operating utilities, has deployed one of the largest plug-in vehicle fleets in the country. Specific to North Carolina, the company operates seven Chevrolet Volts, one Nissan LEAF, one prototype Ford Escape plug-in hybrid, several Toyota Plug-in Prius vehicles, and has demonstrated the Southeast’s first plug-in hybrid bucket truck. The company also has working relationships with General Motors, Nissan, Ford and others to better understand vehicle technology and facilitate the integration of PEVs into the nation’s electric grid.

**Advanced Transportation Energy Center**

Progress Energy Carolinas and NC State University announced in April 2008 the creation of the Advanced Transportation Energy Center. This innovative research center will focus on developing a lighter, cheaper and more-efficient battery and advanced charging systems for PEVs.

**PLUG-IN 2011 Conference**

Progress Energy Carolinas hosted and co-organized a national conference on plug-in vehicles in Raleigh, N.C., in July 2011 – the first time this major industry conference was held outside California. The conference was an outstanding success, including achieving a new record for public night attendance.
**Education and Outreach**

Progress Energy Carolinas is a sponsor and board member of the Sustainable Transportation Education Program (STEP) at the North Carolina Solar Center. This program engages middle and high school students in learning about the transition toward electric transportation.

**North Carolina’s Electric Cooperatives**

*Information provided by NC Electric Cooperatives.*

**Our Support of PEV Development:**

The cooperatives within North Carolina, as well as the North Carolina Statewide Association, have actively participated in the promotion of the PEV market. Individually, many cooperatives have purchased electric vehicles and "wrapped" these cars in PEV promotional attire and featured them at their Annual Member meetings. Collectively, we financially support a Raleigh based organization called Advanced Energy. Dedicated research dollars are provides to assist AE’s PEV market research based initiatives, as well as develop collateral materials for our communities, coops, and their members. NCAEC also has membership with EDTA. Educational PEV support articles and editorials have been featured in our award winning publication “Carolina Country”. In addition, we have provided timely national and North Carolina specific consumer market research on PEVs to this market readiness effort. And lastly, we even have a dedicated solar power charging station for our fleet PEV.

**Policies/Rates/Infrastructure Support:**

Not for profit electric cooperatives, by their very nature, are organizations run by their owners, the members. As the PEV market matures in each individual cooperative’s territory, the cooperatives are nimble to support the needs of the membership accordingly. No one size fits all policy will work in this diverse environment, ranging from deeply rural, to metropolitan bedroom community. As wholesale power purchasers, coops will work closely with their supplier and markets to manage and leverage distribution and energy costs as PEV demand grows.

**9.5 Conclusions**

The NC electric utilities have undertaken many initiatives to better understand and prepare for the adoption of electric vehicles. Part of the task is not only understanding the impact of electric vehicle adoption to the grid but helping the electric rate payers learn about best practices for vehicle usage.

A highlighted in this chapter, the electric utilities in the state are highly engaged in PEV preparedness. Some notable trends include active engagement with collaborative efforts and rate payers, research-based studies, and contributions and recognition on a national scale.
10 IMPLEMENTATION

10.1 Plan Implementation and Monitoring
The recommendations in the previous sections will be carried out through both direct and indirect routes. The local CCFC will collaborate with the statewide NC PEV Taskforce to directly implement applicable recommendations as a part of their larger mission to reduce petroleum usage in the region. The second more indirect route is one that will be carried out by any local governments that replicate this plan for their own jurisdictions. This report has been formatted to facilitate replication by highlighting the questions asked, the sources used, and the public engagement process that was followed. The authors have also worked with the Executive Board of the CCOG and will be asking members to pass a resolution of support for the plan. The template for this resolution can be found in Appendix F. This Board consists of elected officials representing cities and counties across this region and their support of this plan should encourage the CCOG member governments to use this plan as a model for creating their own.

10.2 Amending & Updating the Plan
The NC PEV Taskforce and the CCFC will continue to receive periodic data updates on the number of PEVs in the 9-county Greater Charlotte Region from the NCDMV and EPRI, and will collaborate to amend the plan with this new data as it becomes available. CCFC staff and members of the NC PEV Taskforce plan to review the progress that has been made in this region in working towards recommended actions on a three year basis, with the first review to be held in 2015. At that time, these organizations will also amend or modify the plan’s recommendations as appropriate in light of new data and changes in the regional context as well as to align with other related regional planning initiatives.

Through its participation in this planning process the CCFC will be better prepared to target effective outreach to key audiences within the PEV community in the region. The CCFC will further align its Annual Operating Plan to contribute to the PEV outreach efforts and will track the ongoing efforts of Coalition member organizations. The CCFC will continue to produce PEV case studies, success stories, as part of their normal coalition activities as well as to communicate with community-level stakeholders through stakeholder meetings and outreach events as they occur.
10.3 Continued Support and Funding

Partners in the planning process will continue to engage with the NCSEO and NCDENR to stay appraised of new grant or other governmental funding opportunities to continue plan implementation. The industry partners that we have engaged in this process may also be interested in supporting implementation actions that match their interests in the PEV market in the Greater Charlotte area. These businesses and other private and public organizations will be able to hear about new Federal grant opportunities and informational resources through joining the Centralina Clean Fuels Coalition (CCFC).

Once funding is secured, it will be important to ensure that budgetary decision makers and staff involved with purchasing are made aware of the expenses involved with PEV readiness in order to reduce obstacles in the approval of expenditures. Utilities will also be a possible source of support for the implementation of this plan as they have a large stake in the Greater Charlotte Region’s PEV Readiness. Academic institutions in the region may also be able to provide continued technical support in the form of graduate student internships and research projects. While the coordination and advising of these PEV research projects will take some resources, the creativity, energy and resources of these students may help drive implementation efforts.

Table 13 provides a comprehensive list of Recommendations for the Greater Charlotte Readiness Plan:

<p>| Table 13. Recommendations for the Greater Charlotte Readiness Plan (Version 1.0) |</p>
<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time Frame*</th>
<th>Priority Level**</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Establish key partnerships with fleet managers, local governments, and dealerships.</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>1.2</td>
<td>Correct misinformation that leads to perceived barriers to PEV adoption.</td>
<td>Long-term</td>
<td>High</td>
</tr>
<tr>
<td>1.3</td>
<td>Increase visibility and knowledge of the benefits of PEVs broadly through news media and in a more targeted way through social media, and owner testimonials.</td>
<td>Medium-term</td>
<td>Medium</td>
</tr>
<tr>
<td>1.4</td>
<td>Communicate the benefits and total cost of ownership of PEVs to public and private fleet managers.</td>
<td>Medium-term</td>
<td>High</td>
</tr>
<tr>
<td>1.5</td>
<td>Provide authoritative third party information about PEVs to dealerships to help them respond</td>
<td>Short-term</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>to prospective PEV driver concerns.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2.1</td>
<td>Identify and approach key stakeholders about hosting EVSE</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>2.2</td>
<td>Map existing EVSE and disseminate information</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>2.3</td>
<td>Raise awareness about existing EVSE hosted by your organization</td>
<td>On-going</td>
<td>Medium</td>
</tr>
<tr>
<td>2.4</td>
<td>Identify funding opportunities and develop proposals for EVSE deployment</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>2.5</td>
<td>Distribute guidance info on EVSE benefits, costs, siting and installation</td>
<td>Short-term</td>
<td>Low</td>
</tr>
<tr>
<td>2.6</td>
<td>Educate developers about pre-wiring for EVSE during new construction</td>
<td>Mid-term</td>
<td>Medium</td>
</tr>
<tr>
<td>2.7</td>
<td>Map focus areas for future public EVSE deployment</td>
<td>Short-term</td>
<td>Medium</td>
</tr>
<tr>
<td>2.8</td>
<td>Educate electrical contractors on proper EVSE installation</td>
<td>On-going</td>
<td>Medium</td>
</tr>
<tr>
<td>3.1</td>
<td>Parking: Survey of parking enforcement policies</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>3.2</td>
<td>Parking: Development &amp; enforcement of EV parking policies</td>
<td>On-going</td>
<td>Med</td>
</tr>
<tr>
<td>3.3</td>
<td>Permitting: Administer EVSE Permit &amp; Inspection Survey and distribute Results</td>
<td>On-going</td>
<td>Med</td>
</tr>
<tr>
<td>3.4</td>
<td>Permitting Serve as clearing house for information on EVSE permit &amp; inspection processes, and information on procedures that create barriers to EVSE installation</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>Section</td>
<td>Task Description</td>
<td>Timeframe</td>
<td>Priority</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>3.5</td>
<td>Signage: Facilitate deployment of needed parking and way finding signage on local and state roads</td>
<td>Short-term</td>
<td>High</td>
</tr>
<tr>
<td>3.6</td>
<td>ADA: Distribute ADA best practices developed by NCPEVTF to local governments</td>
<td>Mid-term</td>
<td>Med</td>
</tr>
<tr>
<td>3.7</td>
<td>Zoning: Approach local planning professionals to establish zoning standards based on NCPEVTF recommendations</td>
<td>Short-term</td>
<td>High</td>
</tr>
<tr>
<td>3.8</td>
<td>Building Codes: Provide support to NCPEVTF and work with NC Building Code Council on codes that require EVSE wiring in new construction and renovation</td>
<td>Long term</td>
<td>High</td>
</tr>
<tr>
<td>4.1</td>
<td>Work with local schools to incorporate PEV considerations into their curriculum</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>4.2</td>
<td>Work with local community colleges and universities</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>4.3</td>
<td>Media Outlets</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>4.4</td>
<td>Events and Conferences</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>4.5</td>
<td>Informational Documents</td>
<td>Short-Term</td>
<td>Medium</td>
</tr>
<tr>
<td>4.6</td>
<td>Collaboration with stakeholders</td>
<td>On-going</td>
<td>Medium</td>
</tr>
<tr>
<td>5.1</td>
<td>Explore workplace charging districts</td>
<td>Medium-Term</td>
<td>High</td>
</tr>
<tr>
<td>5.2</td>
<td>Identify and connect local businesses interested in installing charging infrastructure</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>5.3</td>
<td>Update Chambers of Commerce and Economic Development Commissions on PEV Readiness</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>5.4</td>
<td>“Making the Business Case” Informational Documents</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>5.5</td>
<td>Industry Collaboration</td>
<td>On-going</td>
<td>High</td>
</tr>
<tr>
<td>6.1</td>
<td>Encourage local partners to develop incentives (monetary and non-monetary)</td>
<td>Short-Term</td>
<td>High</td>
</tr>
<tr>
<td>6.2</td>
<td>Work through local partners to communicate available incentives</td>
<td>Short-Term</td>
<td>High</td>
</tr>
<tr>
<td>6.3</td>
<td>Support recommendations of statewide readiness plan</td>
<td>Short-Term</td>
<td>High</td>
</tr>
</tbody>
</table>

*Term Lengths for Recommendations*

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>1 to 2 years</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>3 to 5 years</td>
</tr>
<tr>
<td>Long-Term</td>
<td>6 to 10 years</td>
</tr>
<tr>
<td>On-going</td>
<td>No set start or end time</td>
</tr>
</tbody>
</table>

**Priority Levels for Recommendations**

<table>
<thead>
<tr>
<th>Priority Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
</table>
APPENDIX

A. PEV Planning Boundary Survey
B. REVAC Meeting Agendas (2012)
C. REVAC Worksheets
D. CCFC PEV Action Plan
E. CCFC PEV Communications Strategy
F. Sample Resolution
G. North Carolina Utility Matrix
H. Durham City-County Electric Vehicle and Charging Station Plan
I. DOE Sample Plan Outline for PEV Readiness Planning
APPENDIX A

PEV Planning Boundary Survey
Defining Your Region – A Guide to Establishing the Project Area and Focus Area Boundaries for the Mountains to Sea Project

This PEV Planning Boundary Survey is designed to be your guide in a phone interview or in-person meeting with a staff representative from the MPOs in your region. The steps listed below outline the process we are recommending for PIs to follow when defining the boundary for their area (Task 1.1 from Scope of Work). There are two reasons that we recommend following this process. First, we believe that defining the boundary of the project area and focus area based on pre-established criteria such as data used by the MPOs (traffic pattern data, workplace densities, and other considerations) will assist with the justification of the boundary delineations. Secondly, this will allow for the early involvement of area MPOs as stakeholders.

Recommended steps for defining the project boundary in your area:

1. The PEV Planning Boundary Survey will be supplied to PIs to ask their local MPO representatives (See next page).
2. PIs will designate two levels of the project area: 1. Overall project boundaries (may follow regional council’s boundaries), 2. Focus area (defined using responses from survey given to MPO representatives)
3. PIs set up conference call or meeting with MPO staff representatives to ask questions to help determine the boundaries using PEV Planning Boundary Survey as a guide).
4. PIs assess answers collected from MPOs
   a. Use employment centers (or other applicable center) as the center of a 20 and 30 mile radius map to help inform the selection (suggest using Google tool http://maps.forum.nu/gm_driving_radius.html, or GIS to set radius). It is suggested to develop both a 20 mile and 30 mile boundary from established centers (20 miles being the core focus area and 30 miles being the outer range for the focus area). Identify any key areas or municipalities that don’t fall within the 20 and 30 buffers.
   b. Document and provide commentary on selection process.
5. PIs submit survey answers and commentary to Basecamp for all PIs to review. PIs can contact Advanced Energy before posting for support with the analysis.
6. Advanced Energy facilitates conference call/webinar for group discussion of assessment. It is recommended to take good notes of conversation for future documentation such as reports and the community readiness plan.
7. PIs create list of municipalities to be included in the focus area, and create refined focus area map. Both documents to be marked as drafts and posted to Basecamp.
8. PIs return draft maps to MPO representatives for feedback. The intent of this step is to allow for the MPOs to see the draft map and comment on any changes they would recommend.
9. PIs finalize map of project area and focus area boundaries and post to Basecamp (marked as final).
10. PIs present findings to TAC/TCC (Transportation Advisory Committee, and Technical Coordinating Committee) (political decision-makers) to recruit stakeholders (optional, only if time and resources permit).
PEV Planning Boundary Survey for Metropolitan Planning Organization Representatives

North Carolina was awarded a planning grant from the US Department of Energy to create a policy and deployment plan for plug-in electric vehicles statewide. As a necessary first step in the planning process, the state must first be split into the primary communities/regions where electric vehicles are most likely to be adopted. Areas that are predicted to have the greatest number of electric vehicles are employment centers with high concentrations of commuters that travel a maximum of 20 to 30 miles to work (one way). In order to make the best use of federal funds, this initial electric vehicle planning effort will focus on these 20 to 30 mile commute-sheds for the MPO regions associated with the state’s largest municipalities. To define these commutes-sheds we would like to ask you several questions:

1. Within the defined political boundary of your MPO, what are the areas (greater than one TAZ, or other applicable boundary, such as zip code) with the greatest concentration of employment?

2. Would this area change if you were to include your entire modeling area? If so, where is that areas?

3. Disregarding political boundaries, what employment centers would you recommend we use to focus our planning efforts?

4. If you were to draw 20 and 30 mile buffers (network distance) from these employment centers would the area covered be roughly representative of most of the commuters in your region?

5. If you had to support an assertion that these centers are a focal point for commuters, what data would you use?

6. Is there anything else that you feel we need to consider in defining the geographic focus areas for our electric vehicle policy and infrastructure planning? Examples of this could include:
   a. early adopter communities located outside the 20 and 30 mile buffers from employment areas,
   b. daily travel patterns that may not include high work place density locations,
   c. popular local and tourist destinations (accessed daily)

We’d like to invite you or someone else from your MPO to join our planning effort. We are in the process of putting together a regional working group that will guide the creation of this community’s/region’s electric vehicle plan. If you would like to participate in this effort, please let us know and we will notify you of our upcoming meetings.
APPENDIX B

REVAC Meeting Agendas (2012)
AGENDA

1. Welcome & Introductions (3:00 - 3:10) – Sean Flaherty & Jason Wager

2. Regional Plug-in Electric Vehicle (PEV) Activities (3:10 - 3:20) – Jason Wager
   ▪ Over the past 3 years, the greater Charlotte region has seen a number of PEV readiness activities with a broad range of engaged stakeholders.
   ▪ First convened in 2010, REVAC published Action & Communication Plans in June 2011 in addition to creating [www.go4pev.org](http://www.go4pev.org) to house regional data and information for plug-in electric vehicles and charging infrastructure.

3. NC PEV Readiness Initiative: Plugging in from Mountains to Sea (M2S) (3:20 - 3:35) – Sean Flaherty
   ▪ North Carolina received one of 16 electric vehicle community readiness project awards from the US Department of Energy Clean Cities Program.
   ▪ In addition to a statewide taskforce, four regions – Asheville, Charlotte, the Triad and Triangle – are working to create stakeholder groups and develop regional plans addressing specific steps needed to prepare their community for PEVs. NC PEV Taskforce website: [www.ncpevtaskforce.org](http://www.ncpevtaskforce.org)

4. REVAC’s Role in Community PEV Readiness Planning (3:35 - 4:00) – Sean Flaherty
   ▪ Serving as the primary advisory team for creating the greater Charlotte community readiness plan, REVAC stakeholders will be responsible for the following:
     1) Increase awareness and actual consumer usage of PEVs
     2) Identify and resolve barriers to PEVs
     3) Help the greater Charlotte region and state of North Carolina develop PEV readiness plans to support the expected influx of electric vehicles

5. REVAC’s Working Groups (4:00 - 4:25) – Sean Flaherty
   ▪ The Community PEV Readiness Planning process involves engaging stakeholders to explore six different work areas associated with preparing for plug-in electric vehicle adoption:
     1) Vehicles
     2) Infrastructure
     3) Incentives
     4) Economic Development
     5) Policy, Codes and Standards
     6) Education and Outreach

6. Next Meeting/Adjourn (4:25 - 4:30)
   ▪ Thursday, May 24th from 1:30 – 4:00pm
     City of Gastonia Conference Center (145 South Marietta Street, Gastonia, NC 28052)

7. Discovery Place “Solar Tree” and EVSE Tour (4:30 - 5:30)
Regional Electric Vehicle Advisory Committee (REVAC) Meeting  
Thursday, May 24 · 2:00 pm – 4:00 pm  
Gastonia Conference Center (145 South Marietta Street, Gastonia, NC 28052)  

AGENDA  

1. Welcome & Introductions (2:00 - 2:10) – Sean Flaherty, Centralina COG  

2. NC PEV Readiness Initiative: Plugging in from Mountains to Sea (M2S) (2:10 - 2:15) – Sean Flaherty, Centralina COG  
   ▪ North Carolina received one of 16 electric vehicle community readiness project awards from the US Department of Energy Clean Cities Program.  
   ▪ In addition to a statewide taskforce, four regions – Asheville, Charlotte, the Triad and Triangle – are working with local stakeholder groups to develop regional plans addressing specific steps needed to prepare their community for PEVs. NC PEV Taskforce website: www.ncpevtaskforce.org  

3. Regional Plug-In Electric Vehicle (PEV) Activities (2:15 - 2:45) – Sean Flaherty, Centralina COG  
   ▪ Community Position Paper: During the April 12th REVAC meeting at the Discovery Place in Charlotte, regional stakeholders outlined goals and significant activities that have occurred relative to PEV readiness. Staff has authored a draft version of our region’s Community Position Paper and will present for feedback and additional edits before publishing for the general public.  

4. Regional PEV Readiness Focus: Infrastructure (2:45 - 3:20) – Jamie Bond, Duke Energy  
   ▪ Charging infrastructure is obviously required for PEV use. While research shows that PEV owners will do the vast majority of their vehicle charging at home, the availability of workplace and public charging stations is expected to have a significant impact on market adoption of PEVs. In all cases, selecting the proper features, locations, communications with and ownership of PEV charging stations is important and must be addressed.  
   ▪ The primary focus of the stakeholders in the infrastructure work area is to define a plan for deploying residential, workplace, private, and publicly available charging infrastructure in the community.  

5. Regional PEV Readiness Focus: Vehicles (3:20 - 3:55) – Brian Bostic, Enterprise Holdings  
   ▪ The Vehicles work area addresses goals related to increasing the number of PEVs in operation. Stakeholders will explore questions about the suitability and cost-benefit comparison of PEV use versus the use of conventional ICE or hybrid vehicles.  
   ▪ The primary focus of stakeholders in the vehicles work area is to help develop a plan to keep local fleets informed and interested in PEV adoption.  

6. Next Meeting/Adjourn (3:55 - 4:00)  
   ▪ Thursday, June 21st from 2:00 – 4:00pm  
     Cabarrus County Government Center (65 Church Street, Concord, NC 28026)  
   ▪ Regional PEV Readiness Focus Areas: Incentives and Economic Development  

7. Plug-In Electric Vehicle Display (Optional Networking Opportunity)  
   ▪ Several PEVs are on display at the Gastonia Conference Center parking lot. This is an informal networking opportunity to speak with local dealerships in the 9-county region.
AGENDA

1. Welcome & Introductions (2:00 - 2:15) – Sean Flaherty, Centralina COG

2. NC PEV Readiness Initiative: Plugging in from Mountains to Sea (M2S) (2:15 - 2:25) – Sean Flaherty, Centralina COG
   ▪ North Carolina received one of 16 electric vehicle community readiness project awards from the US Department of Energy Clean Cities Program.
   ▪ In addition to a statewide taskforce, four regions – Asheville, Charlotte, the Triad and Triangle – are working with local stakeholder groups to develop regional plans addressing specific steps needed to prepare their community for PEVs. NC PEV Taskforce website: [www.ncpevtaskforce.org](http://www.ncpevtaskforce.org)

3. Regional Plug-In Electric Vehicle (PEV) Activities (2:25 - 2:55) – Sean Flaherty, Centralina COG
   ▪ During the May 24th REVAC meeting at the Gastonia Conference Center, regional stakeholders discussed the Infrastructure and Vehicles work areas to both review state-level activities, and also collaborate in developing local considerations for each topic that are specific to the greater Charlotte area.

4. Regional PEV Readiness Focus: Incentives & Economic Development (2:55 - 3:35) – Kristy Crisp, City of Gastonia
   ▪ Utilizing incentives is an important way to support the level of early adoption necessary to make PEVs a common consumer choice. The Incentives work area covers efforts to define and evaluate various benefits that could be provided to encourage community members to become PEV owners or drivers.

   *The primary focus of stakeholders in the incentives work area is to assess existing incentives and work to develop a plan to communicate the available or anticipated benefits of these incentives for PEV owners and industry. Stakeholders should also consider recommending new incentives that will support the PEV industry.*

   ▪ Ensuring that PEVs are branded as a means for Economic Development opportunities and job creation within the greater Charlotte region can help reach pockets of the community less focused on their more well-known benefits.

   *The primary focus of stakeholders involved in the economic development work area is to contact local chambers of commerce to identify businesses well suited to work with PEVs, develop a list of PEV related industry stakeholders, and explore the preparation of a job creation study based on PEV related industries.*

5. “Ideal EVSE Placement Survey” Exercise (3:35 – 3:55) – Sean Flaherty, Centralina COG
   ▪ REVAC stakeholders will have the opportunity to map out where they believe charging infrastructure should be installed within the 9-county Centralina region. Extra consideration should be given to locations that support economic development.

6. Next Meeting/Adjourn (3:55 - 4:00)
   ▪ July: Date + Time TBD
   ▪ Regional PEV Readiness Focus Areas: *Education & Outreach and Policy, Codes & Standards*
Regional Electric Vehicle Advisory Committee (REVAC) Meeting
Thursday, August 9 - 2:00 pm – 4:00 pm
Davidson Town Hall (216 S. Main Street Davidson, NC)

AGENDA

1. Welcome & Introductions (2:00 - 2:15) – Sean Flaherty, Centralina COG

2. NC PEV Readiness Initiative: Plugging in from Mountains to Sea (M2S) (2:15 - 2:25) – Sean Flaherty, Centralina COG
   - North Carolina received one of 16 electric vehicle community readiness project awards from the US Department of Energy Clean Cities Program.
   - In addition to a statewide taskforce, four regions – Asheville, Charlotte, the Triad and Triangle – are working with local stakeholder groups to develop regional plans addressing specific steps needed to prepare their community for PEVs. NC PEV Taskforce website: www.ncpevtaskforce.org

3. Regional Plug-In Electric Vehicle (PEV) Activities (2:25 - 2:55) – Sean Flaherty, Centralina COG
   - During the June 21st REVAC meeting at the Cabarrus County Government Center in Concord, regional stakeholders discussed the Incentives and Economic Development work areas to both review state-level activities, and also collaborate in developing local considerations for each topic that are specific to the greater Charlotte area.

4. Regional PEV Readiness Focus: Policy, Codes and Standards (2:55 - 3:20) – Joseph Weathers, Mecklenburg County
   - The policies, codes and standards of stakeholders such as municipal planning and inspection departments, electrical contractors, electric utilities, and businesses have a large impact on a community’s successful adoption of PEVs.

   Community stakeholders in the policy, codes and standards work area will focus on two overarching goals:
   1. To identify or eliminate processes or requirements that may unintentionally inhibit the adoption of PEVs or the installation of PEV charging infrastructure.
   2. To define or create policies, codes or ordinances that foster adoption of PEVs and installation of PEV charging infrastructure.

5. Regional PEV Readiness Focus: Education & Outreach (3:20 - 3:35) – Stan Hinson, Modern Nissan of Lake Norman
   - The education and outreach work area will explore the identification of existing or needed resources for electric vehicle knowledge, and develop a plan for disseminating that knowledge to appropriate partners and the public through outreach, training, and marketing.

   The primary focus of stakeholders in the education and outreach work area will be to identify key messaging for target audiences.

   - REVAC stakeholders will have the opportunity to map out where they believe charging infrastructure should be installed within the 9-county Centralina region. Extra consideration should be given to locations with specific policy, codes and standards considerations and education & outreach opportunities.

7. Next Meetings/Adjourn (3:55 - 4:00)
   - REVAC: September/October (Date + Time TBD)
   - NC PEV Taskforce Quarterly Meeting: September 19th 10am – 2:30pm @ Charlotte Convention Center
Regional Electric Vehicle Advisory Committee (REVAC) Meeting  
Friday, October 12 · 9:30 am – 11:30 am  
Centralina Council of Governments (525 N. Tryon Street, 12th Floor, Charlotte, NC)  

AGENDA  

1. **Welcome & Introductions** (9:30 – 9:35) – Sean Flaherty, Centralina COG  

2. **NC PEV Readiness Initiative: Plugging in from Mountains to Sea (M2S)** (9:35 – 9:45) – Sean Flaherty, Centralina COG  
   - North Carolina received one of 16 electric vehicle community readiness project awards from the US Department of Energy Clean Cities Program.  
   - In addition to a statewide taskforce, four regions – Asheville, Charlotte, the Triad and Triangle – are working with local stakeholder groups to develop regional plans addressing specific steps needed to prepare their community for PEVs. NC PEV Taskforce website: www.ncpevtaskforce.org  

3. **Regional Plug-In Electric Vehicle (PEV) Activities** (9:45 – 10:30) – Sean Flaherty, Centralina COG  
   - During the past several months, regional stakeholders discussed the number of issues required to prepare for PEVs and charging infrastructure. Staff will provide a brief summary of these topics based on the working areas to both review state-level activities, and also collaborate in finalizing local considerations for each topic that are specific to the greater Charlotte area.  

4. **Mayor’s Youth Employment Program** (10:30 – 10:50) – Dawn Hill, City of Charlotte  
   - The Mayor’s Youth Employment Program in Charlotte was identified as a target education and outreach method at the beginning of the region’s PEV planning effort by REVAC stakeholders. Program managers from the City of Charlotte will provide a brief overview of their program in order to explore ways to create this partnership.  

5. **Centralina Clean Fuels Coalition** (10:50 – 11:00) – Sean Flaherty, Centralina COG  
   - The Centralina Clean Fuels Coalition (CCFC) has been in existence in the Greater Charlotte Region for over 10 years and was designated in April of 2004 in the Department of Energy’s Clean Cities program.  

6. **Break for Lunch** (11:00 – 11:10) – Sponsored By Ford Motor Company  

   - North Carolina is part of Ford Motor Company’s Phase 2 Rollout of their new Ford Focus Plug-In Electric Vehicle and Ford C-MAX Plug-In Hybrid. Staff representing Ford will provide a brief overview of the company’s PEV strategy and answer questions from REVAC stakeholders.  
   - If you would like to test drive these vehicles, a Ride & Drive event will occur immediately after the meeting from 11:30am - 1:00pm at the half-circle driveway on N. Tryon Street, in front of the 525 Building.
APPENDIX C

REVAC Worksheets
Vehicles Worksheet for the Centralina PEV Readiness Plan

Thank you for serving as a stakeholder in the development of the greater Charlotte region’s first Plug in Electric Vehicle Readiness Plan. Your participation and feedback will provide valuable information for this plan. This worksheet lays out the scope for the “Vehicles” work area.

State Level: Scope of Work from NC PEV Taskforce Vehicles Working Group

- **Objective:** Develop recommendations, best practices, and forecasts that encourage and further prepare North Carolina for widespread Plug-In Electric Vehicle (PEV) adoption.

- **Questions to be explored:**
  - How can we work with the NC DMV to better track the number of registered plug-in electric vehicles in the state?
  - What do the Original Equipment Manufacturers have planned for deployment in NC, and how can we work with them to show our readiness?
  - What are the relevant existing practices and models (nationally and within the state)?

- **Deliverables:**
  - Established connection with NC DMV data sources for regular updates on PEV numbers.
  - An estimate and justification of the number of privately owned personal PEVs, and the number of private or public fleet PEVs. (Requirement from DOE)

Local Level:

- **Objective:** Develop recommendations, best practices, and forecasts that encourage and further prepare The Centralina Community for widespread Plug-In Electric Vehicle (PEV) adoption.

- **Questions to be explored:**
  - Beyond residential consumers, what information do dealerships, and public and private fleets need to make the case for PEVs?
    - What are the best ways to communicate this information?

- **Deliverables:**
  - Analysis of PEV usage patterns
  - Outreach materials for dealerships and fleets.
Please take a moment to consider the questions below:

a. Who are key partners needed to expand the use of PEVs in the Centralina region?

b. What are some approaches to increasing the use of PEVs in our 9-county region?

c. What are the best ways to communicate the benefits of PEVs?

Information about the Centralina Community PEV Readiness Plan

Electric Power Research Institute estimates the greater Charlotte 9-county region (Centralina) will have more than 30,000 PEVs (low estimate) on the road by 2020. In order to accelerate the adoption of these new vehicles, area stakeholders are making a true commitment to the wide-spread acceptance of electrified transportation. The Centralina Council of Governments and Centralina Clean Fuels Coalition are currently developing the first Community-wide PEV Readiness Plan, as part of the Mountains to Sea PEV Readiness Initiative funded by the U.S. Department of Energy. This plan focuses on:

- Economic development, including incentives for the expansion of the PEV industry in the area;
- Vehicle and Infrastructure planning;
- Education, Outreach, Marketing and Training;
- Environmental benefits, consisting of reduced dependence on fossil fuels and improved local air quality; and
- Updating local policy to encourage and not constrain adoption of PEVs.
Incentives Worksheet for the Centralina PEV Readiness Plan:

Thank you for serving as a stakeholder in the development of the Centralina’s first Plug in Electric Vehicle Readiness Plan. Your participation and feedback will provide valuable information for this plan. This worksheet lays out the scope for the “Incentives” work area. We will discuss and fill out the questions on the back page during our meeting.

**State Level: Scope of Work from NC PEV Taskforce Incentives Working Group**
- **Objective:** Develop recommendations, best practices, and forecasts that make North Carolina as advantageous as possible for widespread Plug-In Electric Vehicle (PEV) adoption and business development to grow North Carolina’s green economy with PEV related industries.
- **Questions to be explored:**
  - How can the awareness of both financial and non-financial incentives related to PEV adoption, including the true cost of ownership, be increased?
  - What disincentives for PEV adoption exist, and what strategies can contest them?
  - What kind of incentives, both financial and non-financial, should be created?
- **Deliverables:**
  - Survey of NC stakeholders about potential incentives
  - Analysis of incentives of PEV adoption in other states
  - Facilitate prioritized portfolio of incentives

**Local Level: Scope of Work for Centralina Community PEV Readiness Plan**
- **Objective:** Develop recommendations and best practices for incentives intended to accelerate the adoption of Plug-In Electric Vehicles (PEV) and encourage business development to grow the greater Charlotte’s green economy with PEV related industries.
- **Questions to be explored:**
  - How can the awareness of both financial and non-financial incentives related to PEV adoption be increased?
  - What disincentives for PEV adoption exist, and what strategies can contest them?
  - What kind of incentives, both financial and non-financial, should be created?
  - Who are the key stakeholders in the greater Charlotte region who should be involved/notified?
  - What are the key barriers to establishing local incentives and how can they be addressed?
- **Deliverables:**
  - Document existing local incentives
  - Provide recommendations on local incentives based on stakeholder feedback

Please consider the questions below:
a. Who are key partners needed to develop and implement local PEV incentives?

b. What are some approaches to establish effective incentives?

c. What are the best ways to communicate effective incentives?

Information about the Centralina Community PEV Readiness Plan

Electric Power Research Institute estimates the greater Charlotte 9-county region (Centralina) will have more than 30,000 PEVs (low estimate) on the road by 2020. In order to accelerate the adoption of these new vehicles, area stakeholders are making a true commitment to the wide-spread acceptance of electrified transportation. The Centralina Council of Governments and Centralina Clean Fuels Coalition are currently developing the first Community-wide PEV Readiness Plan, as part of the Mountains to Sea PEV Readiness Initiative funded by the U.S. Department of Energy. This plan focuses on:

- Economic development, including incentives for the expansion of the PEV industry in the area;
- Vehicle and Infrastructure planning;
- Education, Outreach, Marketing and Training;
- Environmental benefits, consisting of reduced dependence on fossil fuels and improved local air quality; and
- Updating local policy to encourage and not constrain adoption of PEVs.
Policies, Codes and Standards Worksheet for the Centralina PEV Readiness Plan:
Thank you for serving as a stakeholder in the development of the Centralina’s first Plug in Electric Vehicle Readiness Plan. Your participation and feedback will provide valuable information for this plan. This worksheet lays out the scope for the “Policies, Codes and Standards” work area.

State Level: Scope of Work from NC PEV Taskforce Infrastructure Working Group
- **Objective:**
  The level and effectiveness of the policies, codes and standards in North Carolina concerning PEVs can greatly affect the state’s capacity to support the vehicles on its roadways as well as its appeal to related opportunities. The Policy, Codes and Standards Working Group will help identify existing policies that can easily be adopted to help promote PEVs.

- **Deliverables:**
  1. **American Disabilities Act (ADA)** - Recommend standards based on national trends, local case-studies and NC Dept. of Insurance guidance.
  2. **Signage** - Develop guidebook for signage based on federal recommendations and other emerging standards.
  3. **Building Codes**
     a. Review current codes for applicable regulations
     b. Approach NC Building Code Council for guidance
  4. **Permitting**
     a. Recommend expedited permitting system for EVSE, Establish “flag” of EVSE / PEV related permits in order to track installations
  5. **Zoning Codes**
     a. Approach local planning professionals to establish zoning standards and recommendations for PEVs and charging infrastructure
     b. Address encroachment agreement and right-of-way issues
  6. **Technical Training** (coordinate w/ Education & Outreach working group)
     a. Electrical Inspectors, Contractor Certification, and Inspection Groups
  7. **Case Studies** - Collect case studies of local ordinances that facilitate the installation of publicly available charging infrastructure and support public access.
  8. **Legislative Considerations**
  9. **Model Plans** - Identify and collect local plans and policies; i.e., Durham City-County Electric Vehicle and Charging Station Plan

Local Level: Scope of Work for Centralina Community PEV Readiness Plan
- **Objective:**
  To address local policy codes and standards that may need to be reviewed or modified to prepare the Triangle for electric vehicle readiness.

- **Deliverables:**
  - Provide research and recommendations on local policy modifications.
  - Provide recommendations to statewide Policy Codes and Standards Working Group for any statewide policies that may need to be reviewed.
Please consider the questions below:

1. Based on today’s discussion, are there one or more policies that should be addressed in your jurisdictions? List your top three.

2. List the best strategies to implement these changes. Who to talk to? What time of year? Who are the decision making bodies that approve the local policies, codes and standards?

3. What are the best ways to assist new PEV owners to navigate through the local policies?
Education and Outreach Worksheet for the Centralina PEV Readiness Plan:
Thank you for serving as a stakeholder in the development of the Centralina’s first Plug in Electric Vehicle Readiness Plan. Your participation and feedback will provide valuable information for this plan. This worksheet lays out the scope for the “Education and Outreach” work area.

State Level: Scope of Work from NC PEV Taskforce Education and Outreach Working Group

- **Objective:**
  In relation to PEVs, Education and Outreach has been widely accepted as both a barrier and an opportunity. The objective of the Education and Outreach working group is to help formulate strategies to increase general PEV awareness among stakeholders such as the green workforce, the public, the government and key organizations.

- **Deliverables:**
  1. **Barriers and Perceptions**: Identify barriers and perceptions related to PEVs
  2. **Target Audiences**: Identify target audiences for education and outreach
  3. **Key Messages**: Determine key messages for each target audience
  4. **Resources**: Develop resources for education and outreach
     a. Fact sheet
     b. Test Drive Kit
     c. YouTube videos
     d. PEV 101 Power Point Presentation
  5. **Communicate Incentives**: Create a plan to communicate monetary and non-monetary incentives for PEVs to target audiences
  6. **Training**: Identify opportunities for training related to PEVs.
     Create a plan to support existing training programs for PEVs across the State
     a. Technical training for charging station installations and inspections
     b. First Responder Training
     c. Community Planning workshops
  7. **Marketing**: Develop a plan for marketing PEVs to target audiences

Local Level: Scope of Work for Centralina Community PEV Readiness Plan

- **Objective:**
  To work within the community to address education, outreach, training, and marketing of electric vehicle related topics.

- **Deliverables:**
  o To document existing education and outreach activities in the greater Charlotte area and to identify recommendations for additional activities and partners.
  o To make recommendations to the state-wide NC PEV Taskforce education and outreach working group if necessary.
Centralina Education and Outreach *(existing initiatives in the Greater Charlotte Area)*

**Duke Energy**
- Focused on how PEV’s will affect the power grid
- Education and Outreach on PEV vehicles
- PEV Rally

**City of Charlotte**
- Power 2 Charlotte
- Outreach and Education Campaign
- PEV Charging Station and Vehicle Project
- Map of Charging Stations

**Educational Institutions (UNCC and CPCC)**
- Engaged in PEV planning work
- Potential to educate students on PEV vehicles and technologies
- Potential to prepare students for technical jobs related to PEV’s

**Discovery Place Museum**
- Hosted the first REVAC meeting for PEVs in 2012
- Installed solar-powered charging station that will become exhibit
Please consider the questions below:

1. List key partners in the greater Charlotte area needed to advance education and outreach initiatives.

2. What are opportunities to support existing local education and outreach efforts?

3. Based on the list provided of existing education and outreach activities in the greater Charlotte, what is missing?

4. In your opinion, what are the top three most important education and outreach activities needed in your area?
APPENDIX D
CCFC PEV Action Plan
Centralina Clean Fuels Coalition
Plug-In Electric Vehicle Readiness

Action Plan

Project Team
Innovative Urban Strategies

Centralina Council of Governments

Phone: 704.372.2416
Fax: 704.347.4710
525 North Tryon Street, 12th Floor
Charlotte, NC 28202-0202
Plug-In Electric Vehicle Readiness
Centralina Clean Fuels Coalition
Action Plan
June 2011

Table of Contents
I. Introduction .................................................................................................................................. 2
   I. A. Emerging Electric Vehicle Technology ................................................................................ 2
   I. B. Area Covered in This PEV Readiness Plan .......................................................................... 3
   I. C. Role of CCFC in Regional PEV Deployment ....................................................................... 3
   I. D. Innovative Urban Strategies ................................................................................................. 5
II. PEV Readiness Important to the Charlotte region ...................................................................... 5
III. Plug-in Electric Vehicle Readiness Efforts To-Date .................................................................. 7
   III. A. National Analysis ............................................................................................................... 7
   III. B. Local/Regional PEV Readiness Activities ......................................................................... 8
IV. Framing the Priorities .............................................................................................................. 11
   IV. A. Gathering Input ................................................................................................................ 12
   IV. B. Guiding Concepts ............................................................................................................. 12
V. PEV Readiness Evaluation........................................................................................................ 12
VI. Recommendations.................................................................................................................... 22
   VI. A. Priorities for 2011 ............................................................................................................ 22
   VI. B. Priorities for 2012-2014 ................................................................................................... 23
VII. Conclusion .............................................................................................................................. 24
VIII. Appendices ............................................................................................................................ 26
   Appendix A: PEV Stakeholder Poll Results ............................................................................... 26
   Appendix B: Clean Cities Coordinators Survey Results ............................................................... 26
   Appendix C: List with links to other relevant action plans or PEV readiness resources ............ 26
   Appendix D: List of REVAC Members and All Regional Stakeholders ..................................... 26
   Appendix E: Readiness Checklists ............................................................................................. 26
   Appendix A: PEV Stakeholder Poll Results – 28 respondents ................................................... 27
   Appendix B: CCFC Clean Cities Coordinators Survey Results, October 2010 ..................... 32
   Appendix C: Links to Other PEV Projects and Resources ......................................................... 36
   Appendix D: REVAC Members and Regional Stakeholders .................................................... 37
   Appendix E: Readiness Checklists ............................................................................................. 38
I. Introduction

Electric vehicle technology has rapidly advanced to offer new levels of environmental and energy savings and economic impact with the advent of the newest plug-in electric vehicles (PEVs).

To prepare for the introduction of PEVs in the United States in 2011 and beyond, communities across the country are evaluating their needs and assessing their resources to ready themselves for the wide variety of changes that these PEVs will require.

The analysis and recommendations presented in this document are intended to build upon the advantage PEVs provide for the greater Charlotte region and position this community as a leading market for the rollout and adoption of this transportation option.

I. A. Emerging Electric Vehicle Technology

Over the past decade, we became familiar with electric car technology in the form of hybrid electric vehicles (Hybrids, or HEVs), such as the Toyota Prius. HEVs combine an internal combustion engine and a high-voltage battery and electric motor. Most of the electricity is produced by generating equipment powered by the gasoline engine. Hybrids can be designed to operate on gasoline, diesel or alternative fuels, which combined with the extra range offered by the electric motor on-board, provides a fuel-efficient, lower emissions alternative to the fully gas-powered vehicle.

A PEV is considered to be all electric, as it is powered by plugging it in to an electric power source to charge its onboard batteries, with no additional gas engine on board (such as the Nissan Leaf). There are no tailpipe emissions from a PEV and the generators and motors in PEVs are extremely efficient, yielding a high conversion of energy to performance. Research and market competition will continue to yield further improvements to the generators, motors, batteries and charging technologies as well.

Some vehicles are actually combinations of the two systems, essentially a plug-in hybrid electric car (PHEV), which includes the Chevy Volt, whose all-electric range has been substantially extended over previous hybrid cars. The main technology of an HEV is used, but with the ability to recharge its larger, high-voltage batteries by plugging it into an external power source, such as an electrical outlet or charging station, which the traditional hybrid cannot. For this reason, these vehicles are also being included in this discussion of PEV deployment.
I. B. Area Covered in This PEV Readiness Plan

The Centralina Council of Governments (CCOG) and the Centralina Clean Fuels Coalition (CCFC) serve the nine-county region in and around Charlotte, from the South Carolina border north past Statesville. The counties include Anson, Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Stanly, and Union.

(See Figure 1: CCOG area map at right) CCOG is one of seventeen state-designated councils of government, home to the state’s largest city and the nearly 25 percent of the population in North Carolina. CCOG provides value to the 9-county greater Charlotte region by controlling the cost of government, growing the economy, and improving quality of life.

I. C. Role of CCFC in Regional PEV Deployment

The CCFC, housed at CCOG, is out-front on the PEV readiness effort for the area.

1) PEV Leadership Benefits Region

The rising availability and interest in PEVs among citizens across the region, the need for access to information specific to the area, and the environmental, energy and economic benefits of the technology mandate the CCFC, with regional responsibilities as set forth by CCOG, to provide leadership for the introduction and integration of the technology among all of its stakeholders: local governments, public and private fleets, private businesses, local consumers, and interested organizations and educational institutions.

CCFC’s PEV Readiness Plan, Communications Plan, Go4PEV website and the Regional Electric Vehicle Advisory Group’s efforts add up to providing a “one-stop” resource for coordinating PEV information and outreach in the region. Priorities for the CCFC include to:

- Inform all of its stakeholders about PEVs in a coordinated and directed way
- Assist with public and private sector fleets and associated charging and other technologies
- Help facilitate a positive consumer experience
• Coordinate with local utilities as they ready themselves for PEV needs
• Assistance to facilitate PEV charging station installation

2) **PEV Readiness Fits CCFC Mission**

The CCFC has been working on behalf of the greater Charlotte region for over 10 years. In 2004, it took on an official role in the US Department of Energy's Clean Cities program, a public-private partnership that brings together federal, state and local governments, the auto industry, private sector fleet operators, fuel providers and community leaders to help communities make their vehicle fleets more energy efficient. Providing leadership by adding PEVs to the regional transportation mix fits the national Clean Cities portfolio of technologies that reduce dependence on foreign fuel, through public policy, public education, information sharing and project collaboration.

3) **CCFC PEV Strategic Planning Informs Regional Readiness**

The following chart, (Figure 2), highlights how the greater Charlotte region’s PEV Strategic Planning efforts were developed and the types of outcomes that will be impacted by these planning efforts.

*Figure 2: PEV Strategic Planning*
I. D. Innovative Urban Strategies

CCFC engaged research and analysis assistance from Innovative Urban Strategies (IUS), a Charlotte-based transportation and urban planning firm that focuses on researching, developing and evaluating programs, policies and initiatives that improve the livability of American cities. With special expertise in alternative modes of transportation and alternative fuels, IUS began working in November 2010 to assist CCFC to ready the region for the deployment of PEVs as a local transportation option by developing a PEV Action Plan and Communications Strategy.

II. PEV Readiness Important to the Charlotte region

The arrival of the new PEVs will impact citizens, the business community/private sector and the government/public sector in a wide variety of ways, based on the confluence of a variety of factors.

- **Rapidly advancing plug-in electric vehicle technology**
  Manufacturers of batteries and charging stations continue to improve and enhance the technologies. Already, lithium-ion batteries used in PEVs have more capacity at fractions of the weight and costs as prior models. Charging technology is advancing, bringing more rapid-charging capability that will especially benefit fleets and public charging stations. With private and public-sector research and product development, multiple efforts across the country are bringing the forefront of PEV technology to the market, expanding opportunities vehicle owners, businesses and local governments for vehicles and charging options.

- **Focus on renewable energy technologies by federal, state and local governments**
  The federal administration has already made a $2.4 billion investment in the development of electric vehicle batteries and other electric drive technology, provides tax incentives for conversions, charging stations and car purchases. Twenty-two states are offering incentives of some sort for adoption and implementation of PEV and EV technologies. The federal government has set a goal of being the first nation to have one million electric cars on the roads by 2015. Multiple programs have been and continue to be underway to promote the deployment of alternative fuel vehicles (AFV) around the country. These initiatives are led primarily by the US DOE Clean Cities program and in locally by the CCFC.

- **Emphasis on reducing dependence on foreign oil**
Leaders in government and business continue to look for ways to reduce America’s dependence on foreign oil for both energy and economic security. A rising urgency to move toward energy security is revealed as over half of the oil used currently is imported. Since American’s still nearly exclusively rely on oil to power our transportation lifestyles, without viable options for transportation particularly, such as mainstream PEV technologies, this dependence will continue to rise.

- **Improving air quality**

Eight counties in the greater Charlotte region are designated by the US EPA as being in nonattainment for ground-level ozone: Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, and Union (as well as York, SC), which means that pollution is exceeding healthy levels. Since an estimated 55% of the ozone air pollution in these regions is emissions from mobile sources (i.e., vehicles), the more widespread adoption of PEV technologies sets the stage for air quality improvements in the greater Charlotte region.

- **Environmental concerns about climate change**

Reducing greenhouse gas emissions continues to be an important strategy in the concern about global warming. Fossil-fuel based vehicles driven in America account for over 1.7 billion tons of CO₂ into the atmosphere each year, with about 6 to 9 tons of CO₂ per year for a typical vehicle. Replacing gasoline-powered vehicles with non-polluting PEVs is a key strategy (?) to move toward a lower-carbon future.

- **Car manufacturers moving forward with new vehicles**

Soon there will be a PEV model for every taste and budget of driver. The PEVs currently available range from the high-end/high-performance Tesla Roadster to the more consumer accessible Nissan Leaf and Chevy Volt. Electric vehicles will continue arriving into the market as countries around the globe also set electric drive transportation goals and face their own oil price and availability challenges. Twenty to 30 different PEV models are expected to be available by 2013. Early estimations predict an estimated 610,000 PEVs will be on the roads in the US by 2015. Though projections vary greatly, Duke Energy estimates up to 10,000 PEVs in the greater Charlotte region by 2015.

- **Energy-centered manufacturing opportunities**

More and more communities are developing opportunities to promote and develop green energy businesses. With increased pressure and desire for energy efficient, clean-sourced business, the push for sustainable commercialization of PEVs will bring more local and regional economic opportunities. These may include automotive and other equipment manufacturers, energy companies who are looking into grid sustainability and power
delivery enhancements, charging technology developers, a variety of component and battery suppliers, and others.

- **Desire for cost savings**
  With the rising cost of gasoline (and diesel) taking a bigger bite out of household, corporate and public sector budgets, PEVs may offer a viable alternative to the cost of driving. Running a vehicle on electricity is one-third to one-quarter less than the cost of running a vehicle on gasoline. Filling up your car at even just $3.00/gallon yields an average cost of 10 cents/mile or more compared to about 2.5 cents/mile for cars charged at average electricity prices. This yields substantial savings for car owners and fleet managers alike.

### III. Plug-in Electric Vehicle Readiness Efforts To-Date

#### III. A. National Analysis

Across the country, various governmental and private entities are leading the way on PEV readiness resources. To inform the Action Plan for the greater Charlotte region, current PEV resources were reviewed, including those prepared by entities in cities and regions around the country such as the cities of Portland, Oregon; Austin, Texas and Los Angeles, California and the states of California and Oregon.

Additionally, other DOE Clean Cities coalitions’ efforts to prepare for new PEVs were reviewed (see Appendix B). Documents and plans put forth by Project Get Ready were reviewed and informed the different aspects of local readiness that the greater Charlotte region should be evaluating and considering. Industry groups like the Electric Drive Transportation Association (EDTA) and vehicle manufacturers are also dedicating substantial resources towards PEV readiness and planning. Coordination with these groups and a careful review of the materials they have put forward were key steps towards ensuring that the greater Charlotte region was taking advantage of information already assembled. For example, Nissan published a *First Responder’s Guide for the Nissan Leaf* which could apply to other plug-in vehicles also. Distributing this to local first responders is an easy step to address the needs to inform and prepare these individuals for responding to incidents involving a plug-in vehicle.

The EV Project is a $250 million effort lead by the DOE to deploy PEV infrastructure in targeted markets around the country. Although North Carolina is not one of the regions, the experiences of the ECOtality team and the regions where they have been operating have been useful in navigating the early deployment of PEV infrastructure and PEV readiness needs in North Carolina.
Additionally, Duke Energy is at the forefront of PEV readiness efforts locally and nationally, and the Duke Energy PEV team has been an important collaborator during the PEV planning process. Several meetings were held with key members of the Duke Energy PEV Team, and they have provided input and direction on the PEV readiness efforts and communications strategies. Duke Energy is and will continue to be the most critical partner for PEV readiness in the greater Charlotte region.

**III. B. Local/Regional PEV Readiness Activities**

Organizing PEV education, outreach and funding administration has been led locally by the CCFC, with a broad range of regional stakeholders and in close cooperation with Duke. Over the past two years, the greater Charlotte region has seen a number of readiness actions and activities, including the following:

- **Fall 2009:** CCFC formed the Electric Vehicle (EV) Subcommittee of key EV industry partners and stakeholders. This group has guided much of the CCFC’s EV efforts since.

- **Spring 2010:** CCFC staff sat on the review committee for Clean Fuel Advanced Technology (CFAT) program, reviewing several EV/EVSE-related proposals that were ultimately awarded funding.

- **Began working with the City of Charlotte, Charlotte Center City Partners, Duke Energy and others have been working on an EV charging station project, paid for by City Energy Efficiency and Conservation Block Grant (EECBG) funding. Grant funds are paying for the purchase and installation of over 20 public locations for vehicle charging while leveraging approximately an additional 30 charging locations along with marketing efforts.**

- **Engaged Mecklenburg County Code Officials and Duke Energy in the development of a targeted event around EVs and code officials. Identified Mecklenburg County automated permitting process as unique and among the most streamlined in the country relative to EV charging installation at residential locations.**

- **May 2010:** Began administration of Carolina Blue Skies and Green Jobs Initiative, an ARRA-funded Clean Cities award to a NC/SC bi-state partnership. Over $2 million has been awarded to projects in the greater Charlotte region that CCFC oversees – including advanced technology, hybrid electric projects with Duke Energy and the Charlotte Douglas International Airport – valued at a combined total of $1.8 million.

- **July 13, 2010:** CCFC, through sponsorship by Duke Energy, held the *Greater Charlotte Region Electric Vehicle Charging and Permitting Event* in Mooresville. Attracted
approximately 90 participants with speakers from Duke Energy, Mecklenburg County Code Enforcement, AeroVironment, and Nissan.

- July 22, 2010: Traveled to Washington, DC and represented the Greater Charlotte Region among other leading “EV ready” metropolitan areas across the country at the US Department of Energy’s *Plug-in Vehicle and Infrastructure Workshop*.

- Summer 2010: CCFC staff were asked to review applications for competitively solicited State Energy Program Alternative Fuel and Advanced Vehicle Technology Funding put forth by the NC State Energy Office.

- Solicited input from CCFC staff by US DOE regarding the greater Charlotte region’s readiness planning process and status.


- Summer 2010: Conducted a survey of Clean Cities Coordinators nationwide to gather input and insight on other EV readiness initiatives taking place around the country.

- Fall 2010: CCFC funded the installation of five (5) Level II public charging stations in the City of Gastonia at the Downtown Gastonia Convention Center and the Schiele Museum. City of Gastonia followed this award up with application for funds to purchase ten (10) Nissan Leaf vehicles through local Congestion Mitigation and Air Quality (CMAQ) grant dollars.

- Partnered in additional projects to implement public charging stations in Charlotte (through EECBG grant with match provided by corporate partners) and parts of South Carolina (e.g., Rock Hill) through partnership with the Palmetto State Clean Cities Coalition.

- Fall 2010: CCFC engaged consultant Innovative Urban Strategies to expand current EV Action Planning and Communication Strategy activities

- Fall/Winter 2010: Conducted an online poll of stakeholders about perceptions of EV readiness in the greater Charlotte region (questionnaire results included in Appendix A)

- December 16, 2010: CCFC convened the Regional EV Advisory Committee (REVAC), comprised of key public and private sector EV stakeholders from the greater Charlotte region, at CCOG offices. (Membership list included in Action Plan Appendix D)
• Completed design of a Go4PEV.com logo and tagline.

• December 2010: PEV charging stations installed at two Bank of America-owned surface parking lots in center city Charlotte as well as at Duke Energy’s Mint Street Parking Deck

• December 2010: CCFC engaged a consultant to develop a PEV Action Plan to be complete by June 2011, assessing PEV readiness in the greater Charlotte region and recommending action steps to be taken

• January 2011: CCFC completed a Communications Strategy for 2011 messaging and methods for disseminating information to the public

• February 2011: The Greater Charlotte Region Plug-in Electric Vehicle Readiness Action Plan is complete, as well as the Greater Charlotte Region PEV Communications Strategy.

• February 2011: Duke Energy files paperwork with the Utilities Commission to allow a pilot program to better understand how residential customers charge their electric vehicles and how to incentivize off-peak charging

• February 2011: Ritz Carlton installs ChargePoint plug-in charging station in their parking deck

• February 23, 2011: CCFC met with members of Duke Energy’s PEV team to discuss strategy and communications synergies

• Began development of the Go4PEV website content and design.

• March 10-13, 2011: Press event in uptown Charlotte followed by the three day Nissan Drive Electric Tour came to Concord, North Carolina

• March 17, 2011: The “Green Day” media event at the Schiele Museum in Gastonia, North Carolina was held to publicly announce the first PEV charging station in Gaston County (see Figure 3 Photos on p 11)

Figure 3 Schiele Museum Photos
May 5, 2011: CCFC held the second REVAC meeting to share the draft Communications Strategy and draft EV Action Plan and to collect information about existing conditions, current needs and action steps required for PEV readiness in the region.

June 14, 2011: CCFC was the lead applicant in the *NC PEV Readiness Initiative: Plugging in from Mountains to Sea* proposal in response to the Clean Cities Community Readiness and Planning for Plug-in Electric Vehicles and Charging Infrastructure funding opportunity worth $5 million. Awards expect to be announced in late summer/early fall.

June 15, 2011: CCFC held the third REVAC meeting to share the Go4pev.com site map and content as well as some of the action plan content and collected ideas to inform recommendations.

Currently, the CCFC is:

- Accepting $50k in funding from the US Department of Energy that includes a PEV Planning component, helping to further regional efforts in this area.
- Continuing to communicate with and engage National Renewable Energy Lab (NREL) staff interested in our local code permitting processes as they develop a national template.
- Finalizing and launching Go4PEV website as a “one-stop” portal for local PEV information.

**IV. Framing the Priorities**
CCFC identified a need to develop principles to prioritize next steps for regional PEV readiness, communication and other preparedness efforts to guide this PEV readiness effort in the greater Charlotte region.

**IV. A. Gathering Input**

Responses were gathered during an interactive discussion and prioritization exercise at the December 16, 2010 Regional Electric Vehicle Advisory Committee (REVAC) meeting. And, similar questions were posed to additional stakeholders through an online questionnaire in an attempt to prioritize the readiness Action Plan and Communications Strategy. Full results of the questionnaire are available in Appendix A.

**IV. B. Guiding Concepts**

Based on the input obtained at the December REVAC meeting, combined with responses received from the online questionnaire, three (3) Guiding Concepts for local/regional PEV readiness were developed to help establish the Greater Charlotte region’s priorities moving forward. As reviewed and approved by REVAC, these guiding concepts are:

1. **Educate** potential consumers and regional stakeholders about the features and benefits of PEVs in order to ensure a positive customer experience.

2. **Prepare** the greater Charlotte region as a clean energy and advanced technology leader working towards energy independence by utilizing PEVs.

3. **Collaborate** with regional PEV stakeholders to develop and/or support purchase and ownership incentives for PEVs and the supporting public and private infrastructure.

**V. PEV Readiness Evaluation**

To evaluate the greater Charlotte region’s readiness for the anticipated PEV roll-out from multiple vehicle manufacturers in 2011 and beyond, a matrix-based PEV readiness evaluation tool was developed and completed. The matrix includes the following:

† **Categories:**
Based on a review of national and regional efforts, eight main categories of PEV readiness were identified where efforts should be addressed, including the following: *(not prioritized)*

1. First responder & safety
2. Monitoring & evaluation of ongoing PEV readiness efforts
3. Planning & financing for PEVs and charging infrastructure
4. Public charging
5. Policies (permitting processes, incentives, zoning requirements)
6. Public information & outreach
7. Stakeholder coordination
8. Workforce development

*N Phases:*

In addition, the review of the eight categories above is offered in a matrix according to the following:

1. Existing conditions
2. Current needs
3. Action steps
### PEV Readiness Matrix:

<table>
<thead>
<tr>
<th>Existing Conditions</th>
<th>Current Needs</th>
<th>Action Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First responder &amp; safety</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>✅ National Fire Protection Association (NFPA) and GM are partnering to provide first responder training online and through workshops (<a href="http://www.evsafetytraining.org">www.evsafetytraining.org</a>)</td>
<td>✅ Assess training that has been issued or is being offered locally</td>
<td>✅ Survey local first responders to assess level of training received and training desired</td>
</tr>
<tr>
<td>✅ National Alternative Fuels Training Consortium (NAFTC) based in West Virginia offers first responder training for other alternative fuel vehicles</td>
<td>✅ Assess the level of interest among first responders in training programs</td>
<td>✅ Encourage National Alternative Fuels Training Consortium (NAFTC) to offer First Responder Training Course on PEVs at Levine Campus</td>
</tr>
<tr>
<td>✅ Nissan Leaf has published First Responder’s guide (<a href="http://www.nissantechninfo.com/refgh0v/og/FRG/2011-Nissan-LEAF-FRG.pdf">http://www.nissantechninfo.com/refgh0v/og/FRG/2011-Nissan-LEAF-FRG.pdf</a>)</td>
<td></td>
<td>✅ Encourage NFPA to offer PEV first responder trainings in the region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✅ Ensure that trainings offer continuing education credits and focus on training incumbent workers</td>
</tr>
<tr>
<td>Monitoring &amp; Evaluation</td>
<td>Action</td>
<td>Plan</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>CCFC is working with stakeholders in the region, across the state and across the nation to understand and coordinate PEV readiness efforts</td>
<td>Study and understand how public charging infrastructure will be used</td>
<td>Continue local, statewide and national readiness coordination</td>
</tr>
<tr>
<td>Duke Energy rolling out pilot project for residential and commercial chargers to understand charging behavior</td>
<td>Mechanism to report to Duke Energy when new charging stations are installed in the region</td>
<td>Based on analysis of Duke Energy pilot programs and charging station data, identify locations for future public opportunities</td>
</tr>
<tr>
<td>CCFC is monitoring where charging stations are installed in the region</td>
<td></td>
<td>Develop strategy for continued stakeholder engagement and communications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upload station locations in greater Charlotte region to the Alternative Fuel Data Center (AFDC)</td>
</tr>
<tr>
<td>Planning &amp; financing</td>
<td>Existing Conditions</td>
<td>Current Needs</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>§§ CCFC convening stakeholders and gathering information about PEV activities</td>
<td>§§ A mechanism to report where charging stations are installed</td>
<td>§§ Coordinate with others across North Carolina to share information and affect change</td>
</tr>
<tr>
<td>§§ Duke Energy trying to understand PEV purchasing and charging behavior in their territory</td>
<td>§§ Sample building code language to support PEV readiness</td>
<td>§§ Develop draft building code language that can be incorporated by local municipalities.</td>
</tr>
<tr>
<td>§§ For-profit companies paying for costs of installing charging infrastructure in exchange for funds collected for parking in those spaces</td>
<td>§§ Sample land use regulations to support PEV readiness</td>
<td>§§ Develop draft land use ordinance language that could be incorporated by local municipalities</td>
</tr>
<tr>
<td>§§ CCFC lead agency in DOE grant application for PEV planning</td>
<td>§§ Certification process for licensed EVSE installers</td>
<td>§§ Automated notification process for Duke Energy to receive the addresses of all PEVs purchased</td>
</tr>
<tr>
<td>Public charging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Ø City of Gastonia installed first of five municipal charging stations</td>
<td>Ø A comprehensive list of where public charging stations are currently installed or planned in the region</td>
<td></td>
</tr>
<tr>
<td>Ø City of Charlotte planning to install 26 stations, uptown Charlotte and CATS park-n-ride locations</td>
<td>Ø Some consistency and uniformity for station functionality and station signage in the region (and nationally)</td>
<td></td>
</tr>
<tr>
<td>Ø Bank of America installed 10 stations, uptown Charlotte parking lots</td>
<td>Ø Upload public charging stations to Alternative Fuels Data Center (AFDC) and integrate into local communications as possible</td>
<td></td>
</tr>
<tr>
<td>Ø Duke Energy installed 20 stations, uptown Charlotte parking decks</td>
<td>Ø Develop a communications strategy for public charging station availability in the greater Charlotte region</td>
<td></td>
</tr>
<tr>
<td>Ø Planning to install stations: Wells Fargo (uptown Charlotte), Charlotte Douglas International Airport</td>
<td>Ø Evaluate usage of public charging and determine where future stations should be located</td>
<td></td>
</tr>
<tr>
<td>Ø Station installed at Ritz Carlton Charlotte</td>
<td>Ø Integrate data collection and customer interface among various manufacturers’ public charging stations</td>
<td></td>
</tr>
<tr>
<td>Existing Conditions</td>
<td>Current Needs</td>
<td>Action Steps</td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Stakeholders seem to have basic understanding of major state policies with regards to:</td>
<td>Analysis of other relevant state regulations</td>
<td>Create policies that respond to information collected from Duke Energy pilot programs</td>
</tr>
<tr>
<td>Providing Handicap spaces</td>
<td>Draft building code language</td>
<td>Explore zoning requirements for multi-family developments</td>
</tr>
<tr>
<td>Prohibitions on re-selling power</td>
<td>Draft land use planning language</td>
<td>Pursue NC state tax rebate for PEV &amp; EVSE</td>
</tr>
<tr>
<td></td>
<td>Mechanism to notify Duke Energy when an EVSE is installed in greater Charlotte region</td>
<td>Explore issues related to the continuation of gas tax or move towards other types of vehicle tax at state/federal level</td>
</tr>
<tr>
<td></td>
<td>Understand insurance implications for auto or home insurance policies</td>
<td>Address any challenges related to home or auto insurers and PEVs or EVSE</td>
</tr>
<tr>
<td>Public information &amp; outreach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Communications Strategy developed for greater Charlotte region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Coordination between CCFC and Duke Energy communications team</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Regional websites developed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Duke-energy.com/plugin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Go4PEV.com</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Power2charlotte.com</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Regional Electric Vehicles Advisory Committee (REVAC) convened</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Initial input gathered from about 50 identified PEV stakeholders in region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Utilities and industry leaders partnered to create goelectricdrive.com</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Readiness checklists for individuals, businesses and government</td>
</tr>
<tr>
<td>- Additional funds for implementing recommendations in Communications Strategy</td>
</tr>
<tr>
<td>- Launch Go4PEV.com website and conduct outreach to direct public to the site</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Pursue funding opportunities and joint marketing efforts to promote Go4PEV.com website and to distribute PEV readiness checklists</td>
</tr>
<tr>
<td>- Explore continuing education courses about owning a PEV</td>
</tr>
<tr>
<td>Stakeholder coordination</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Workforce development</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>¤ Region features firms that manufacture batteries, vehicle component, hybrid buses, etc.</td>
</tr>
<tr>
<td>¤ Underwriter’s Laboratory offers an online course in PEV Charging Station Installation (<a href="http://www.uluniversity.us">www.uluniversity.us</a>)</td>
</tr>
<tr>
<td>¤ Institutes of higher education like CPCC and UNC Charlotte are interested in offering courses to provide job training for PEV professionals</td>
</tr>
<tr>
<td>¤ Most vehicle manufacturers are training their own technicians first</td>
</tr>
<tr>
<td>¤ Green jobs efforts by local economic development groups</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>List of training opportunities for individuals/entities who are interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>¤ Understand strategic advantages of the Charlotte market for PEV production and component development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Develop consortium of institutes of higher education who are interested in workforce development around PEVs</th>
</tr>
</thead>
<tbody>
<tr>
<td>¤ Work with Nissan and other OEMs so Charlotte is an early city for training</td>
</tr>
<tr>
<td>¤ Develop forum (perhaps within Chamber of Commerce) for business collaboration around PEVs</td>
</tr>
<tr>
<td>¤ Build upon existing green job recruitment efforts by local economic development groups</td>
</tr>
</tbody>
</table>
VI. Recommendations

VI. A. Priorities for 2011

Based on the information gathered from stakeholders over the past eight months and the information gleaned from the analysis revealed in the PEV readiness matrix, a variety of important recommended next steps have emerged for the greater Charlotte region.

Because of the rapidly changing dynamics surrounding PEVs, recommendations are divided into those to be prioritized for 2011 and those that can be implemented over the next one to three years, during the 2012 to 2014 timeframe. These recommendations are organized according to the Guiding Principles from the REVAC and stakeholder input, outlined previously on page 12 above.

EDUCATE

• Roll out Phase I Communications Strategy recommendations. Specifically, focus on the following:
  o Launch Go4PEV.com website
  o Organize press events

• Develop and begin to implement a strategic stakeholder outreach plan

PREPARE

• Work with partners to upload new and future charging station locations to NREL’s Alternative Fuel Data Center (AFDC)
• In collaboration with Duke Energy, collect baseline data about PEVs in the region such as:
  o Home and public PEV charging behavior
  o PEV awareness in the region
• Review existing and planned public charging infrastructure distribution and timing and identify future needs
• Continue to work on streamlining permitting processes based on best practices in other jurisdictions
  Pursue state incentives for PEVs and green jobs related to PEVs

COLLABORATE

• Continue REVAC stakeholder group coordination
• Continue State PEV Task Force coordination
• Partner with community colleges and technical schools to coordinate education/training efforts to prepare for employment opportunities with PEVs
• Work with the 2012 Democratic National Convention host committee and others to partner on ways to accelerate PEV infrastructure investments in the greater Charlotte region

VI. B. Priorities for 2012-2014

EDUCATE
• Roll out Phase 2 Communications Strategy recommendations, including:
  o Paid and earned media
  o Special events to allow more people the opportunity to drive

• Expand stakeholder outreach and public communications efforts. Reach out specifically to:
  o Business owners/fleet owners
  o Planners/architects
  o Real estate developers
  o Automobile manufacturers and dealers
  o First responder and vehicle recovery personnel
  o Code enforcers

PREPARE
• Work with municipalities in the region to begin to adopt zoning code amendments to require provisions for charging in new multi-family or commercial developments
• Collect and analyze data about charging station behavior to understand where public charging stations may be needed
• Develop draft zoning code language for municipalities who want to require provisions for charging in new multi-family or commercial developments
• Develop sample building code language that can be adopted by municipalities across the state
• In collaboration with Duke Energy, develop a profile of likely PEV adopters and map hot spots for likely PEV adoption

COLLABORATE
• Coordinate regional DC Fast Charge (also called Level 3) public charging infrastructure, especially along major highways and thoroughfares to enable PEV travel on longer trips
• Work with partner agencies like the Charlotte Regional Partnership and Charlotte Chamber of Commerce on workforce development and economic development efforts related to bringing PEV related jobs and companies to the greater Charlotte region
• As more plug-in electric vehicles become available, work with local dealerships to make sure that sales personnel understand the specifics for successfully charging PEVs in the area.
• Based on response to initial efforts, consider how PEVs can work in car share or car rental applications, and develop partnerships to make the greater Charlotte region a leader in these types of occasional PEV usage.

Other priority action steps may emerge as new information and opportunities on PEVs emerge via existing and forthcoming PEV readiness efforts in the greater Charlotte region and around the country.

**VII. Conclusion**

The greater Charlotte region is on its way to readiness for the deployment of PEVs. Yet more remains to be accomplished to leverage the environmental, energy and economic benefits that can accrue to the region when local residents, businesses and governments move ahead into PEVs.

In order to attract significant public and private investment that will push the region to the forefront of the PEV landscape, the recommendations outlined in the previous section are needed. This will be accomplished most readily by focusing on the specific advantages of and for the Charlotte region.

To best achieve these and all PEV readiness efforts, it is important to maintain flexibility in the implementation of these strategies. The ability to adapt to new and changing market conditions, technologies and local needs will be critical to the success of the greater Charlotte region’s PEV readiness effort.

**Leadership**

An assessment of regional progress in PEV to date, based on participation of the range of stakeholders and level of interest in PEV technology, reveals that the greater Charlotte region holds a genuine interest and commitment to being a leader in the PEV movement. In the report “Electric Vehicles in America,” Roland Berger Strategy Consultants and Rocky Mountain Institute’s Project Get Ready identify which of America’s 50 largest metro areas are currently most prepared for PEVs, which are making progress to develop the necessary ecosystems in the near future, and which need to accelerate to accommodate the imminent launch of PEVs. See Figure 4 below for the readiness chart that came out of this study, noting Charlotte’s location and rank for “momentum.”

*Figure 4 PEV Readiness of 50 largest U.S. cities*
Regional Advantages

The greater Charlotte region has distinct advantages as it relates to PEVs and PEV readiness. Some of these advantages include:

- Mecklenburg County Code Enforcement’s Trade Internet Permitting (TIP) system
- Temperate weather
- Headquarters location of companies with substantial commitments to environmental sustainability and energy efficiency
- Automotive supply chain companies

Responsiveness

As implementation of the Action Plan begins, the recommendations need to be flexible enough to meet the changes in:

- Local and national conditions
  - Changes in gas prices, fluctuations of interest, etc.
- PEV/EVSE technology
  - Emergent battery technology, new vehicle models, advances in charging infrastructure, etc.
• Fleet and other adoption/application venues, (e.g., taxi, car share)
• Funding availability
  o Grants or incentives
• Oil supply disruption due to policy shift, national security, national disaster, etc.
• Other as yet unidentified factors, which may include other financial, supply or market occurrences

**VIII. Appendices**

*Appendix A:* PEV Stakeholder Poll Results
*Appendix B:* Clean Cities Coordinators Survey Results
*Appendix C:* List with links to other relevant action plans or PEV readiness resources
*Appendix D:* List of REVAC Members and All Regional Stakeholders
*Appendix E:* Readiness Checklists
## Appendix A: PEV Stakeholder Poll Results – 28 respondents

### How prepared do you think the following are for EVs in the Greater Charlotte Region:

<table>
<thead>
<tr>
<th>Stakeholder Category</th>
<th>Very Prepared</th>
<th>Somewhat Prepared</th>
<th>Neutral</th>
<th>Somewhat Unprepared</th>
<th>Very Unprepared</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlotte area local government code inspectors</td>
<td>19.2%</td>
<td>23.1%</td>
<td>3.8%</td>
<td>26.9%</td>
<td>7.7%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Charlotte area local government fleets</td>
<td>3.8%</td>
<td>15.4%</td>
<td>19.2%</td>
<td>26.9%</td>
<td>11.5%</td>
<td>23.1%</td>
</tr>
<tr>
<td>Charlotte area local government planners</td>
<td>7.7%</td>
<td>30.8%</td>
<td>23.1%</td>
<td>11.5%</td>
<td>3.8%</td>
<td>23.1%</td>
</tr>
<tr>
<td>Charlotte area electric utilities</td>
<td>34.6%</td>
<td>34.6%</td>
<td>3.8%</td>
<td>7.7%</td>
<td>0</td>
<td>19.2%</td>
</tr>
<tr>
<td>Technical/vocational training institutions</td>
<td>0</td>
<td>34.6%</td>
<td>11.5%</td>
<td>26.9%</td>
<td>15.4%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Car mechanics</td>
<td>0</td>
<td>3.8%</td>
<td>19.2%</td>
<td>34.6%</td>
<td>34.6%</td>
<td>7.7%</td>
</tr>
<tr>
<td>First responders/safety professionals</td>
<td>0</td>
<td>15.4%</td>
<td>7.7%</td>
<td>30.8%</td>
<td>23.1%</td>
<td>23.1%</td>
</tr>
<tr>
<td>EV charging equipment companies</td>
<td>26.9%</td>
<td>42.3%</td>
<td>3.8%</td>
<td>11.5%</td>
<td>0</td>
<td>15.4%</td>
</tr>
<tr>
<td>Major auto manufacturers</td>
<td>11.5%</td>
<td>53.8%</td>
<td>11.5%</td>
<td>15.4%</td>
<td>0</td>
<td>7.7%</td>
</tr>
<tr>
<td>Regional car dealerships</td>
<td>3.8%</td>
<td>34.6%</td>
<td>30.8%</td>
<td>19.2%</td>
<td>7.7%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Media outlets</td>
<td>0</td>
<td>29.2%</td>
<td>29.2%</td>
<td>8.3%</td>
<td>16.7%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Retailers (e.g., shopping malls, grocery stores, etc.)</td>
<td>0</td>
<td>0</td>
<td>15.4%</td>
<td>23.1%</td>
<td>57.7%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Electrical contractors</td>
<td>0</td>
<td>30.8%</td>
<td>19.2%</td>
<td>7.7%</td>
<td>26.9%</td>
<td>15.4%</td>
</tr>
<tr>
<td>General public in Charlotte area</td>
<td>0</td>
<td>11.5%</td>
<td>7.7%</td>
<td>34.6%</td>
<td>34.6%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Your Organization</td>
<td>19.2%</td>
<td><strong>50</strong></td>
<td>15.4%</td>
<td>7.7%</td>
<td>7.7%</td>
<td>0</td>
</tr>
</tbody>
</table>
### Please provide a brief description of your organization’s efforts around EVs.

**Collection of responses:**

The City of Monroe has been conducting research regarding the development of EV regulations. Monroe is in the preliminary stages of planning EV regulations in the zoning ordinance, building code or land development plan possibly all.

Block grant project includes installations in Center City ROW and additional stations installed by major employers.

We have developed an online permitting process which allows a contractor to self-facilitate permit issuance of a permit under certain conditions. We have a streamlined plan review & permitting process for small commercial projects.

City Chevrolet is ready with product knowledge of the new Volt that will be hitting the ground in the first quarter of 2011.

We will support this effort to our membership and audience if we receive specific information about progress, implementation and timeline.

We manufacture a complete line of Level 1 & 2 EV charging stations.

Beginning to educate officials.

Our small town has done nothing except wait and see if an electric car ever rolls through town.

Standard has national programs in place to educate managers and clients in electric vehicles, charging, possible revenue models, electrical requirements, vendors for stations, preferred electrical contractors, and adoption rates.

Purchase of PEV's, Installation of some charging stations, Participation in local and industry events and programs, establishment of department devoted to EV readiness.

The introduction of EV's has been discussed but nothing beyond this.

Hybrid vehicles are a part of CPCC’s curriculum.

We are in pre-design of electrical charging stations for EV's. We already have 97 LSV's and Electric Utility Carts in operation.

We have incorporated training and hands on opportunities for conversion of an ICE vehicle to an electric vehicle in our curriculum. We have also made an alternative fuels/electric/hybrid class a requirement for graduation for an Associates degree in automotive technology.

Will install ev charging stations at our town facilities in the next 2 years.

We at Meck County have already begun training both internal and external. We have been communicating with the utilities in order to be ready in advance of the auto market.

Purchasing first generation production PEV and charging stations, which will be in place the first quarter of 2011.

Made permitting process presentations to contractors and participating in establishing a qualifiers list certifying that contractors have been trained for permitting process and product training.

Our role in this would be to create communication platforms to increase awareness and acceptance of EVs in the mind of the general public.

Attended a seminar in Davidson NC on EV's. We have talked and have gone over permitting of these stations.

The automotive technology programs at CPCC's North Campus are preparing to add EV technologies to their curriculum.
### What is the greater Charlotte region doing well with regards to EVs?

**Collection of responses:**

- Acknowledging that we need to begin planning for EVs.
- The initial pilot programs have offered a good opportunity to test theories and begin conversations with role players.
- Promoting the concept of electric vehicles.
- I am not sure if anything is being done?
- Permitting process seems ready.
- Duke Energy is active in other EV groups across the US & is well positioned to make this a success. The fact that Center City groups have moved toward installing charge points downtown is also a plus.
- Centralina is at least getting out information. Local car dealers are clueless. The manufacturers are only trying to sell gas guzzlers that have high mark-ups.
- Very limited discussions take place in economic councils about EV.
- Outside of Duke and Clean Cities staff and members, I don't see a lot happening.
- The ability to fast track the permit process is a positive step.
- Education of principles (Duke Power, City of Charlotte) as to what will be needed.
- Promoting that these vehicles are available now and should be considered for fleet use.
- Duke Energy is on top of the EV challenges and taking steps to communicate this to their customers.
- Communication events. I think Centralina has played a pioneer role in this effort.
- Have had seminar presentations with Nissan and at Community College to introduce and publicize EV opportunities.
- Installation of electric charging stations.
- Communication, Education.

---

**Appendix A: PEV Stakeholder Poll Results, continued**
**What unique advantages or assets does the Charlotte region have regarding EV readiness?**

- Good market for early adopters, collaborative approach to planning
- A wide variety of car dealerships, large consumer base, and very knowledgeable and experienced contractors.
- GM has picked the Greater Charlotte Region to manufacture the batteries at an area factory
- Extremely qualified and eco-conscious electrical contractors and alignment with Duke Energy headquarters.
- In our area the power companies and officials have a close working relationship.
- The Meck County permitting process is a very BIG asset. We need to let them be the "clearing house" for all "connection" requests in this region.
- EVs will sell in this region when they are available at a reasonable price.
- Charlotte Center City Partners and Standard Parking with support from Duke, Bank of America, and Wells Fargo are driving EV charging station installations in Charlotte.
- Area leadership that will be willing to embrace EV's
- Major Metro area with a vast majority of commutes within the driving range of EV's coming to market.
- Duke Energy and Electricities, both are electrical power utilities are pushing the use of these vehicles.
- City has bought into goals of EV and advanced same through participation in charging stations.
- Electric companies, etc willing to take time and make an effort in pre-planning

**What are the major obstacles the greater Charlotte region is facing when it comes to EVs?**

- Not being prepared for the release of EV's regarding charging stations and accommodations.
- A bit behind other cities/regions in the EV infrastructure, media awareness
- The limited range of the EV's emphasize the need to install charging stations throughout the area.
- Electric ports to plug in the EV's
- Lack of charging stations, charging station availability in region
- Preparedness and Readiness
- Planning by local municipalities for EV charging
- There is a lot of hype in all types of media about EVs coming to town. I believe that most folks know something about them but may not really know how close we are to having them as part of our daily life. This lack of knowledge is our greatest "opportunity".
- EVs will not sell in this region until they are available at a reasonable price.
- Lack of knowledge of capabilities, availability, and cost seem to be the biggest hurdles faced.
- Manufacturer/dealer knowledge and readiness, public understanding,
- The cost of the cars are very expensive at this time.
- High cost associated with EV
- Public buy in and economics

Appendix A: PEV Stakeholder Poll Results, continued
### In what ways can the Charlotte region do more to prepare for EVs?

<table>
<thead>
<tr>
<th>Revise all building codes and zoning ordinances to require the installation of charging stations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>communication and level setting across affiliated industries, media &amp; marketing</td>
</tr>
<tr>
<td>Solicit the need for grants for businesses to offset expenses for the purchase and installation of charging stations.</td>
</tr>
<tr>
<td>Have charging stations designated.</td>
</tr>
</tbody>
</table>

#### Education and Advertisement

The greatest need is a way to find connect all the groups & agencies working on this project. Everyone involved has to know what the other is doing. We can share our successes & discuss our roadblocks.

- Keep getting out information about EVs.
- Media blitz to educate the public is truly the only way to gain acceptance of this new technology.
- Create more public awareness about EV’s
- Educate the public as to the benefits of EV’s
- Install charging stations all across the region.

#### Communication events

- Media events
- EV promotion
- State refund for EX purchases

Move this concept into the mainstream….make it something that average people embrace and adopt

More educational seminars for the general public, utilities, inspection departments

### Most organizations have tools that they use to communicate with the public. What tools are used by your organization that could help share public messages about EV readiness? *Please check all that apply.*

**Top 6 Communication Tools Available, In order of frequency:**

- Website (92%)
- Email Alerts (56%)
- Press Releases (52%)
- E-Newsletters (52%)
- Social Media (36%)

### Has your organization purchase or do you have plans to purchase EVs?

<table>
<thead>
<tr>
<th>n Yes — 45%</th>
<th>n No — 33%</th>
<th>n Maybe — 35%</th>
</tr>
</thead>
</table>
### Appendix B: CCFC Clean Cities Coordinators Survey Results, October 2010

<table>
<thead>
<tr>
<th>Participating Entity</th>
<th>Population of Target Area</th>
<th>Type of Area and Name</th>
<th>Timeframe: When started</th>
<th>Best Practices: Participating in formal program? Other details shared?</th>
<th>Comments/Clean Cities Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama Clean Fuels Coalition</td>
<td>4.8 million</td>
<td>Alabama’s 67 counties</td>
<td>Just starting when reporting in October 2010</td>
<td>Planning meetings are scheduled.</td>
<td>Mark Bentley did not provide more details at survey time</td>
</tr>
<tr>
<td>Clean Fuels Ohio</td>
<td>5 million</td>
<td>6 county region: Efforts encompass several metropolitan areas now: Central Ohio, Toledo Metro Area, Lima area, Cincinnati area. Others may be added.</td>
<td>March 2010</td>
<td>Some local partners likely to join Project Get Ready; Just getting started. Engaging utilities, specific state departments, certain MPOs, and emergency responders. Plan to do more to engage local code officials, state PUC, auto dealers and others.</td>
<td>“We struggled to gain interest at first. Now there is so much interest, it’s difficult to manage.” Sam Spofforth</td>
</tr>
<tr>
<td>Florida Space Coast Clean Cities</td>
<td>Houston Clean Cities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 million</td>
<td>6 million</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 counties in Central Florida/Orlando area</td>
<td>Houston-Galveston-Brazoria Region: Metro area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January 2008</td>
<td>January 2010</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Established a formalized working group, Central Florida EV Initiative - Trying to read and anticipate the automotive industry is challenging</td>
<td>Established an EV working group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities and conventional power organizations are among the best stakeholders.</td>
<td>“We’ve found that our normal course of action, to try to find funding for a project to facilitate, is not a big help in this instance. Charging stations are so inexpensive, electrical companies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“You need to develop a program and business plan and follow it as much as possible.” Bill Young</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Clean Cities               | 4 counties of Land of the Sky area | March 2010 | Formed an EV Committee to start process;  
- Have a small core group that is expanding membership as more learn about them.  
- Success working on forums with utilities in area. | “We just partnered with AE on their SEO proposal to put in 25 Level II systems in the Asheville area.” Bill Eaker |
|---------------------------|------------------------------------|------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Valley of the Sun Clean Cities | 3 counties in Central and Southern Arizona | March 2010 | Not part of a formal EV initiative; working with ~15 municipalities | A grant for installation of over 1,000 charging stations “makes all the difference.”  
“Success will be the installation of the stations on the schedule” William Sheaffer |
<p>| Virginia Clean Cities     | Most of Virginia; 140              | May 2010   | Project Get Ready; Coordinated with | Lots of great stakeholders “coming out of the woodwork” and surprising ease of getting |</p>
<table>
<thead>
<tr>
<th>counties</th>
<th>Raleigh’s efforts</th>
<th>state DOT and Secretary of Transportation involved.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-Large volume of stakeholders needed, but smaller groups usually accomplish more.</td>
<td>Aiming for a leadership position and ultimate goal of having “individuals able to successfully purchase and refuel vehicles.”</td>
</tr>
<tr>
<td></td>
<td>-Uncharted territory means more work by organizers.</td>
<td>Alleyn Harned</td>
</tr>
</tbody>
</table>
Appendix C: Links to Other PEV Projects and Resources

Duke Energy
www.duke-energy.com/plugin

Go Electric Drive Association
www.GoElectricdrive.com

Electric Power Research Institute Guide to Electric Vehicles
www.epri.com

U.S. Department of Energy
Alternative Fuels and Advanced Vehicles Data Center (AFDC)
http://www.afdc.energy.gov/afdc/about.html
Public Charging Stations Map/Info
http://www.afdc.energy.gov/afdc/locator/stations/

The EV Project – US DOE and ECOtality
http://www.theevproject.com/

Plug-in America - Nonprofit electric vehicle advocacy organization
http://www.pluginamerica.org/

Project GetReady - A non-profit initiative led by Rocky Mountain Institute, in conjunction with a wide array of partners and technical advisers.
http://projectgetready.com/

Plug In Cars – Community of automobile and PEV enthusiasts
Http://www.plugincars.com
### Appendix D: REVAC Members and Regional Stakeholders

<table>
<thead>
<tr>
<th>Member Name</th>
<th>Company/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jess Halvorsen</td>
<td>Bank of America</td>
</tr>
<tr>
<td>Mike Rowand</td>
<td>Duke Energy</td>
</tr>
<tr>
<td>Jamie Bond Allen</td>
<td>Duke Energy</td>
</tr>
<tr>
<td>Rob Phocas</td>
<td>City of Charlotte</td>
</tr>
<tr>
<td>David Smith</td>
<td>City of Charlotte</td>
</tr>
<tr>
<td>Jim Bartl</td>
<td>Mecklenburg County</td>
</tr>
<tr>
<td>Will Plentl</td>
<td>Charlotte Airport</td>
</tr>
<tr>
<td>Larry Lane</td>
<td>UNC Charlotte</td>
</tr>
<tr>
<td>David Jones</td>
<td>UNC Charlotte</td>
</tr>
<tr>
<td>Chris Bauer</td>
<td>CATS</td>
</tr>
<tr>
<td>Larry Parker</td>
<td>City Chevrolet (Hendrick Auto Group)</td>
</tr>
<tr>
<td>Kevin Mueller</td>
<td>Enterprise Rent a Car</td>
</tr>
<tr>
<td>Kristy Crisp</td>
<td>Gastonia</td>
</tr>
<tr>
<td>Dave Navey</td>
<td>Charlotte Truck Center</td>
</tr>
<tr>
<td>Lisa Stiwinter</td>
<td>City of Monroe</td>
</tr>
<tr>
<td>Kevin Grant</td>
<td>Cabarrus County</td>
</tr>
<tr>
<td>Ron Smith</td>
<td>Celgard</td>
</tr>
<tr>
<td>Ed Stawicki</td>
<td>CPCC</td>
</tr>
<tr>
<td>Mark Auten</td>
<td>Fire Marshal (Meck County)</td>
</tr>
<tr>
<td>Jeff Bostian</td>
<td>Asst Fire Marshal (Meck County)</td>
</tr>
<tr>
<td></td>
<td>Charlotte Fire Department Chief of</td>
</tr>
<tr>
<td>Kevin Gordon</td>
<td>Training</td>
</tr>
<tr>
<td>Bridgette Robb</td>
<td>GE</td>
</tr>
<tr>
<td>Kevin Frasz</td>
<td>GM</td>
</tr>
<tr>
<td>Robert Taylor</td>
<td>City of Charlotte</td>
</tr>
<tr>
<td>Michel Kernizan</td>
<td>Eaton Corporation</td>
</tr>
<tr>
<td>Carl Rivkin; Mike Simpson</td>
<td>National Renewable Energy Lab (NREL)</td>
</tr>
</tbody>
</table>

**STAFF:**

<table>
<thead>
<tr>
<th>Staff Name</th>
<th>Company/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison Billings</td>
<td>Innovative Urban Strategies</td>
</tr>
<tr>
<td>Jason Wager</td>
<td>Centralina Clean Fuels Coalition</td>
</tr>
<tr>
<td>Emily Parker</td>
<td>Centralina Clean Fuels Coalition</td>
</tr>
<tr>
<td>Cady Dawson</td>
<td>Innovative Urban Strategies</td>
</tr>
</tbody>
</table>
Appendix E: Readiness Checklists

CCFC’s Moving Ahead with Plug-in Electric Vehicles (PEV)

GUIDE SHEET for Individuals

Switching to a plug-in electric vehicle is as simple as buying the vehicle and plugging it in. But here are a few more considerations to make the experience as successful as possible. Don’t get overwhelmed! There’s assistance for you every step of the way.

GETTING STARTED

Do you typically drive fewer than 75 miles per day?
Do you have access to another vehicle for longer trips?
Are you are willing to invest in a charging station or other extra equipment as needed?

GETTING A VEHICLE

Do you know the current makes and models available in your area?
- Have you looked online and talked to local dealerships?
- Have you reserved through the automaker’s website to purchase or lease?
- Are you willing to wait for vehicles to become available?

GETTING STARTED WITH CHARGING

Do you know that charging from your current 110 volt (Level 1) outlet may take up to 20 hours to fully charge your vehicle?
If you intend to install a Level 2 charger at home to fully charge your vehicle in 8 hours or less, have you considered the following?:
- Do you own a home?
  - If not, do you have permission from the home owner or landlord to install an PEV charging station?
- Did you verify that your home owners association doesn’t prohibit installation of chargers?
- Do you have a garage?
  - If not, have you identified a place to install a home charger?
- Do you have adequate capacity in your circuit breaker panel to add the additional load of a 220 volt (Level 2) charger?
- Have you identified a local electrical contractor?
- Has your contractor installed other charging stations in your city or town?
  - If not, do they know the permitting process for installing an PEV charging station in your city or town?
Add the rest of the Checklists here.
APPENDIX E

CCFC PEV Communications Strategy
June 2011

Contact:
Jason Wager, AICP
Sustainability Program Manager
Clean Cities Coordinator
704.348.2707
jwager@centralina.org

Communications Strategy
Project Team

Innovative Urban Strategies

Centralina Clean Fuels Coalition
Plug-In Electric Vehicle Readiness

Communications Strategy

Centralina Council of Governments
Phone: 704.372.2416
Fax: 704.347.4710
525 North Tryon Street, 12th Floor
Charlotte, NC 28202-0202
Plug-In Electric Vehicle Readiness for Centralina Clean Fuels Coalition

COMMUNICATIONS STRATEGY
June 2011

The Centralina Clean Fuels Coalition (CCFC) as part of the Department of Energy’s Clean Cities Program is establishing itself as a regional leader convening local stakeholders and developing an action plan that will assess the regions’ readiness for the arrival of plug-in electric vehicles (PEVs). The recommended tactics in this Communications Strategy are predicated upon the priorities established by stakeholders in meetings and survey responses, as identified in the CCFC PEV Readiness Action Plan Outline.

I. Purpose

A. Goal
The goal of this Communications Strategy is to present recommendations for mass communication and public information tactics and tools that fulfill the Centralina Clean Fuels Coalition’s objectives to:

- **Accelerate and expand** the use of PEVs
- **Position CCFC as the regional leader** in disseminating information to the region.

Implementing this Communications Strategy will help address the identified need to raise awareness and educate the Charlotte region about PEVs.

B. Objectives
The following outreach objectives emanate from and help fulfill the guiding concepts identified by the Regional Electric Vehicles Advisory Committee (REVAC) and other stakeholders in the greater Charlotte area: to Educate, Prepare and Collaborate. This communications plan will:

- **Create awareness** of readiness in the greater Charlotte region for the introduction of PEV technology
- **Educate and define** stakeholders’ roles in introduction of PEVs to the region
- **Increase knowledge** among the community about their PEV options
II. Strategic Analysis

The stage is being set for a dramatic rise in interest in plug-in electric vehicle (PEV) technologies and demand for information from all sectors of the economy and citizenry. Increasing awareness is being driven by:

- **Rapidly advancing electric vehicle technology**
  Batteries and charging stations have many times the capacity at fractions of the weight and costs as prior models.

- **Focus on renewable energy technologies by federal and state government**
  The federal administration has already made a $2.4 billion investment in the development of electric car batteries and other PEV technology, provides tax incentives for conversions, charging stations and car purchases, and joins the incentives in 22 states.

- **Emphasis on reducing dependence on foreign oil**
  Leaders in government and business continue to look for ways to reduce American’s dependence on foreign oil, over half of which is currently imported and is on the rise.

- **Environmental concerns about climate change**
  The public mindset about global warming has precipitated substantial interest in reducing greenhouse gas emissions.

- **Need to improve regional air quality**
  Fossil-fuel based vehicles driven in America account for over 1.7 billion tons of CO₂ into the atmosphere each year, with about 6 to 9 tons of CO₂ per year for a typical vehicle. Currently, the Greater Charlotte region has been designated a moderate non-attainment area by the U.S. EPA, which indicates that the air quality exceeds federal health standards, including ground-level ozone. This designation has implications for local health as well as potential further restrictions on industry and possibly federal transportation dollars into the future.

- **Car manufacturers moving forward with new vehicles**
  From the Tesla Roadster already available, to the delivery of the Nissan Leaf and Chevy Volt in 2011, electric cars will make a splash in the market. Twenty to thirty different plug-in car models are expected by 2013, and by 2015, an estimated 610,000 PEVs will be on the roads in the US. Though projections vary greatly, Duke Energy estimates up to 10,000 PEVs in the region by 2015.

- **New trends in land use planning**
  The land-use planning, local government, developer communities and local citizenry are moving toward more nuanced views of growth and sprawl. This movement has implications for local transportation needs and planning for more use of technologies that partner with mass transit, cycling and other forms of alternative transportation.
III. Information Needs

A. Overcome obstacles among stakeholders

Regions face several obstacles, both perceived and real, in integrating PEVs into the mainstream. Municipalities, utilities and other stakeholders will need to develop new policies and procedures for infrastructure as well as address other potential barriers to market acceptance such as:

- non-uniform (or, varying) governmental permitting and codes
- preparedness of the electric grid
- availability of public charging stations

B. Increase knowledge among individuals

Consumers will seek and need vital information from local, state and federal government agencies, utility companies and automobile dealerships about this new generation of plug-in electric vehicles. Early adopters will likely be concerned about:

- driving range of PEVs (range anxiety)
- customer service issues (i.e., who to call for specifics)
- high maintenance costs/and or availability of repair facilities (perceived or real)
- availability of public charging stations/standardization of plugs
- cost/permitting of home charging stations

IV. Proposed Strategy

A. Develop and implement status as information hub

The CCFC will be positioned as the clearing house for local government agencies, utility companies, public and private fleets, automobile dealerships, private businesses, other organizations and educational institutions, and individuals in the greater Charlotte region.

- Initiate a web site to serve as the regional cornerstone of the communication outreach efforts.
- Take action as the lead organization to find out and share information about the PEV technology and the status of current infrastructure (charging station sites) and other pertinent information.

B. Use marketing and outreach techniques

Establish top-of-mind awareness with a strong and repetitive presence in the market place using:

- **Consistent Branding** - Develop a brand/name for program/logo/tagline and call to action message
- **Launch Media Campaign** – Create concentrated one-month outreach effort
- **Maintain Presence** – Leverage partnerships to continue awareness and outreach efforts
V. Target Audiences

The communications plan is designed to reach these top six audiences important to fulfilling demand for information and providing next steps details to early adopters, decision-makers and other stakeholders.

1. Local government officials and staff
2. Entities with large vehicle fleets and/or large employers
3. Business owners (retail, services, parking lots, multi-family residential)
4. Organizations and institutions (trade associations, chambers, business districts, higher education)
5. Consumers (early adopters - high tech, environmentally sensitive, shorter commutes, high incomes two car garage)
6. Community-at-large

VI. Communications Tactics

Based on the desire to launch communication strategies that fulfill CCFC’s goal of accelerating and expanding the use of plug-in electric vehicles (PEVs) and to create awareness, educate and define the roles of key stakeholders, and increase knowledge in the community about PEV options, the following communications tactics are recommended. The recommendations are divided into two phases, using paid, earned and social media, and planned to be implemented as financial resources are available.

• Phase I is a one to three-month concentration on creating awareness and brand recognition for the web site and program.
• Phase II will build upon and expand the outreach of the website and information channels. Several of the following tactics will be implemented over a four to twelve week period, with more tactics being used as budget and time permits.

Proposed Communications Tactics and Timeline Key:  

Cost Range: $0-$500  Resources: Int= Primarily Internal Staff/Requirements
Cost Range: $500-$2000  Resources: Ext=Primarily External Staff/Requirements
Cost Range: $2000 - $5000
Cost Range: $5000 - up
<table>
<thead>
<tr>
<th>Months from Launch (Year One)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>Int</th>
<th>Ext</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I (Months 1 -3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposed Paid Media Tactics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Website with opt-in email newsletter list-builder tool</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$$$$</td>
<td>X</td>
</tr>
<tr>
<td>Print advertising in local newspapers and/or magazines including trade association magazines</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$$</td>
<td>X</td>
</tr>
<tr>
<td>Radio (traffic reports/community access channel, NPR, spot ads)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$$$$</td>
<td>X</td>
</tr>
<tr>
<td>Media co-operative sponsorships</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$$</td>
<td>X</td>
</tr>
<tr>
<td>Electric vehicle branded with name of program/logo/web site</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$$$$</td>
<td>X</td>
</tr>
<tr>
<td>A launch event</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Inserts/buck slips in stakeholders’ mailings</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Proposed Earned Media Tactics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>News releases</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Short feature article and/or ad for organizational collateral (newsletters, utilities, neighborhood organizations, trade groups)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>High profile community leader or celebrity spokesperson</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Public Service Announcements (PSAs)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$$</td>
<td>X</td>
</tr>
<tr>
<td>Proposed Social Media Tactics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email newsletter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook page</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Phase II (Months 4 -12)**

### Proposed Paid Media

<table>
<thead>
<tr>
<th>Service</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>$</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct mail – postcard campaign</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blog/regular website updates</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Video productions</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Co-operative advertising (with sponsors)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Professional PowerPoint outline for local presentations</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Internet ads</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Transit advertising</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Brochure/flyer – how and what to expect when owning a EV</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

### Proposed Earned Media

<table>
<thead>
<tr>
<th>Activity</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>$</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain active email list to send press releases, links to other sites, blog</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create press worthy news and disseminate to media, especially “green media”</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Develop facebook presence and get people to like</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Link with sites such as the Community Environmental Council (CEC)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$</td>
<td>X</td>
</tr>
<tr>
<td>Develop contest or events to draw people to facebook, web site and/or twitter. Examples: free month of charging; free week of driving PEV (partner with utility or car dealership)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$-$</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Leverage public relations – take advantage of green events and green media</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>$</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

CCFC Communications Strategy
VII. COMMUNICATIONS MESSAGES

A branded, consistent message and colorful, attractive logo will give the campaign a readily identifiable look and be easily remembered. Messaging will promote the following features and benefits of PEVs in the region, for launch, web site and continued outreach.

**Sample Messaging of Features:**

- The greater Charlotte region is prepared and ready for PEVs
- How local jurisdictions can get ready for PEVs
- Basic information on owning and operating PEVs
- Environmental benefits of using PEVs
- Links to obtain national information
- EVs compatibility with lifestyle
- Be a leader in the introduction of PEVs in the community
- How, where and cost to charge your PEV
- Education/retraining on PEV technology
- Encourage businesses to invest in PEVs

**Sample Messaging of Benefits:**

- PEVs and infrastructure are available now and/or soon in the area – number of charging stations, charging at home
- Use PEVs as second, commuter car for work trips, shopping, errands, doctor appointments, etc
- Availability of governmental and private incentives
- Easy access to information - visit web site or call CCFC for all your answers
- Businesses – invest in charging stations/great employee benefit
- Savings calculations (cost savings, gas savings, and CO2 savings)
- Be labeled as a “green” organization
- Be part of the PEV movement
VIII. Next Steps

- Select name, logo, tagline and web address for the PEV readiness efforts in the Greater Charlotte region.
- Build website for communications efforts
- Implement Phase 1 communications strategies mid-late 2011.
- Adapt and change messaging as PEV technology is adopted within the Centralina region and the public’s awareness and education increases.
- Begin implementing Phase 2 communications strategies early 2012.
- CCFC should look for additional resources and partnerships, especially with Duke Energy and the Duke Energy Foundation, to continue funding communication activities into the future.
A Resolution to Promote Plug-in Electric Vehicle Planning in Region <insert letter designation of region>

Whereas North Carolina has the opportunity to harness consumer spending on electric vehicles and charging infrastructure to bolster local manufacturing and technology firms, support economic development and job creation and help address air-quality related health concerns; and

Whereas consumers are demanding electric vehicles, vehicle manufacturers are responding positively to this increased consumer demand and the increasing adoption of electric vehicles has not been halted by a weak economy; and

Whereas as of the summer of 2012, North Carolinians were already operating over 700 electric vehicles of personal, governmental and commercial applications; and this number is projected to grow to more than 90,000 in 2020.

Whereas local governments in Region <insert letter designation of region> can support the adoption of electric vehicles through their ability to exercise control over budgets that allocate funds for local PEV readiness planning and incentives; set policies to track the installation of charging infrastructure through their permitting office to enable better utility planning; and make commitments to purchase cost-saving PEVs when replacing appropriate vehicles in their fleets; and
Whereas the <insert name of plan> supports the creation of further PEV Readiness Plans by local governments by providing the current state and local information and a comprehensive and replicable format; and

Whereas the North Carolina Plug-In Electric Vehicle Taskforce is working in support of electric vehicle adoption across the state as an engine for clean-air economic growth; and

Whereas local governments in Region <insert letter designation of region> promote economic development and job creation and are responsible for protecting and enhancing the health, welfare and safety of their residents in prudent and cost-effective ways; and

Whereas the people of Region <insert letter designation of region> will benefit significantly through the success of the <insert name of plan> and the electric vehicle through a stronger economy and cleaner air.

Now, therefore be it resolved, that the <insert name of regional organization and name of governing body> pledges to promote the replication and adoption of the <insert name of plan> to its member governments, employees and residents as appropriate to help build the local electric vehicle economy.

Adopted and approved this <insert date> the day of <Month> <year>.

ATTEST: <insert name>, Chairman

<insert name>, Executive Director
APPENDIX G

North Carolina Utility Matrix
<table>
<thead>
<tr>
<th>PEV Policies</th>
<th>Duke Energy Carolinas (information provided by Duke Energy Carolina)</th>
<th>Progress Energy Carolinas (information provided by Progress Energy Carolinas)</th>
<th>Dominion (Information provided by Dominion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Policies and Plans for Accommodating the Deployment of Plug-in Electric Drive Vehicles:</td>
<td>Duke Energy has a comprehensive internal readiness plan which includes a Power Delivery notification and circuit evaluation process, a customer service plan and internal communication plan. Duke Energy has also launched several customer and fleet pilots to evaluate various charging technologies, charging behaviors of PEV drivers and impacts to the grid.</td>
<td>Progress Energy Carolinas has a comprehensive internal readiness plan which includes grid impact scenario analyses, a utility notification arrangement with automakers, updated customer service guides as well as website information related to PEVs, and an internal communication and education plan. Progress Energy Carolinas has also launched several customer and fleet research projects to evaluate various charging technologies, charging behaviors of PEV drivers and impacts to the grid.</td>
<td>Dominion has undertaken various PEV readiness activities. The readiness efforts are outlined below.</td>
</tr>
</tbody>
</table>
| Policies and Plans for Rate Structures or Provisions: | Duke Energy is evaluating the potential of utilizing a whole house TOU rate that would appeal to our PEV driving customers. | Progress Energy Carolinas is gathering a baseline of plug-in vehicle charging behavior from its load research project to better understand consumer charging behavior. Data from this project will allow the utility to better understand how vehicle charging may overlap with peak demand times, if additional rate structures may provide value in shifting peak energy usage, and how they may be best designed. Progress Energy Carolinas currently offers a whole house time-of-use rate which may be utilized by customers with PEVs. | Dominion has filed, received approval and is now implementing two electric vehicle pilot rate projects in its Commonwealth of Virginia service territory:  
- Schedule 1EV – a whole house TOU EV rate  
- Schedule EV - a dedicated Electric Vehicle only rate  
Both of these rates offer time of use price signals to encourage off peak vehicle charging. It is the Company’s intention to offer similar EV rates in North Carolina as vehicle penetrations in our service territory warrant. |
<table>
<thead>
<tr>
<th>Policies and Plans for Billing Protocols for Charging of PEVs:</th>
<th>Duke Energy has not developed any specific policies/plans for billing protocols for charging PEVs. The utility is using its various PEV pilots to help it determine what additional policies and protocols will be needed as PEV adoption grows in the Duke Energy territories.</th>
<th>Progress Energy Carolinas has not developed any special policies/plans for billing protocols for charging PEVs. The utility is using its various PEV research programs to help it determine what additional policies and protocols will be needed as PEV adoption grows in the Progress Energy Carolinas territory.</th>
<th>See above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policies and Plans for Analysis of Potential Impact to Grid:</td>
<td>Duke Energy has established a Power Delivery notification and circuit evaluation process through which circuits are evaluated as new PEV customers are added to the system. The utility has also completed a grid impact analysis to provide insight into the types of effects that PEV charging could have on various circuits and how much tolerance local grid infrastructure has to support PEV charging before major infrastructure upgrades are needed.</td>
<td>Progress Energy Carolinas has established a notification arrangement with several major automakers and is evaluating the best solutions moving forward with greater adoption rates of plug-in vehicles. The utility has also completed grid impact scenario analysis across generation, transmission, and distribution to assess the potential impacts related to plug-in vehicles including an in-depth model analysis of a representative circuit outside Raleigh, NC. Under the expected penetration rates of PEVs and with modest charge rates, the grid impact is expected to be negligible in the near term. Local and isolated transformer upgrades may be necessary in some cases, although the number and exact location will vary depending on specific loading, vehicle density, and equipment ratings. These models and assessment studies are continually updated as new information becomes available related to PEV adoption rates, charging levels, and charging behaviors.</td>
<td>Dominion has performed various grid studies related to the potential loading impacts due to EV charging. Our studies have indicated that the distribution system impacts will be localized. Studies were performed assuming a Level 2 (3.3 kW) vehicle charging at peak using three levels of PEV penetrations (5%, 10% and 20%). Even at the 20% penetration, only minor localized changes were required to our distribution system. At the 5% and 10% penetrations levels, most grid impacts were negligible. However, these results may vary based on location and vehicle density. Dominion will continue to collect valuable energy usage and customer charging behavior data from its PEV Pilot Program. The resulting load shapes found in this study will be used to update our initial grid impact assumptions and will allow us to analyze the various scenarios to see if price signals are adequate incentives to shape charging behavior. Dominion is also gathering vehicle penetration and location data from various sources including Dominion’s EV rate participants, Virginia DMV, General Motors, Nissan and Ford Motor</td>
</tr>
</tbody>
</table>
Policies and Plans to Minimize the Effects of Charging on Peak Loads:

<table>
<thead>
<tr>
<th>Company. This data will allow us to locate the owners’ addresses on a map and monitor the potential impacts to the distribution grid using our vehicle demand and energy usage data. The EV Pilot Program, along with efforts to collect data from the electric permitting process, will allow us to assess grid impacts and the necessity of infrastructure upgrades. Data from the OEM vehicle manufactures will also be collected in North Carolina.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duke Energy currently offers a demand response program to retail and commercial customers to mitigate energy consumption during peak times. Although the utility does not currently have any policies to minimize the effects of on-peak charging, Duke Energy has implemented a number of PEV pilots to evaluate the impacts of on-peak charging and plans to test demand response offerings as part of its pilot activities.</td>
</tr>
<tr>
<td>Progress Energy Carolinas currently offers a whole house time-of-use rate for residential customers and demand response programs offered to retail and commercial customers to mitigate energy consumption during peak times. Although the utility does not currently have any policies to minimize the effects of on-peak charging for electric vehicles, Progress Energy Carolinas has implemented a charging station load research project to evaluate the impacts of PEV charging and plans to test demand response offerings as part of its research activities. Independent of rate structures, Progress Energy Carolinas actively communicates and encourages utilizing the built-in capability of PEVs to charge off peak when it meets the needs of the drivers.</td>
</tr>
<tr>
<td>Both of our pilot rate options are designed to encourage off-peak charging in an effort to avoid adding load to our current peak. One rate option is for EV-charging only and requires a separate meter to measure the energy usage associated with recharging. 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 is a whole-house rate that relies on a single meter to measure electricity usage associated with the entire house. A customer could recharge his or her EV for as little as 51 cents per night for a 40-mile commute using this rate.</td>
</tr>
<tr>
<td>Policies and Plans for Making Widespread Utility and Grid Upgrades:</td>
</tr>
</tbody>
</table>
APPENDIX H

Durham City-County Electric Vehicle and Charging Station Plan
Durham City-County
Electric Vehicle and Charging Station Plan

Goal: Encourage the use of plug-in electric vehicles in Durham as a substitute for petroleum powered vehicles to help achieve community-wide air quality and greenhouse gas emissions reduction goals.

Background
Plug-in electric vehicles (PEVs) are now commercially available. Car companies that are manufacturing PEVs have identified the Triangle as one of the areas that they will initially target with the vehicles. As manufacturers ramp up production, more PEVs will hit the streets in North Carolina in the coming years. It is important that adequate charging infrastructure be in place to provide confidence in the public’s mind that PEVs are viable options as well as to enable PEV owners the ability to travel throughout the area with as little inconvenience as possible.

Widespread use of PEVs can help Durham meet local air quality and greenhouse gas emissions reduction goals1. PEVs do not emit exhaust and, therefore, do not contribute to local emissions of air pollutants such as nitrogen oxide, carbon monoxide, and particulate matter. Pollutant emissions and greenhouse gas emissions from the electricity generation and transmission needed to charge the vehicles will vary depending on the time of day the vehicle is charged and the source of the electricity. PEVs charged at night and other off-peak times will contribute no additional emissions because power plants generate excess energy at those times to maintain a base level of generation. As smart grid technology becomes more prevalent, PEVs could act as storage for this excess electricity and discharge it back to the grid during peak periods to off-set peak loads, which would further reduce pollution and greenhouse gas emissions.

Most private PEVs will be charged at home overnight when electricity can be less expensive and it is convenient to plug the vehicles in for a long period of time. However, the early PEVs have a shorter range than conventional vehicles, and if one runs out of battery charge on the road, there is no easy way to recharge the vehicle. There can be anxiety on the part of the PEV owner if they perceive that they will not be able to charge while away from home. This “range-anxiety” can be a barrier to greater acceptance of these vehicles by the public or could discourage a PEV driver from visiting Durham locations. Having a network of publically accessible charging stations can alleviate that anxiety.

The City is installing two EVCSs in the City Hall Annex parking garage for fleet vehicles and has installed two at Golden Belt for fleet vehicles and public use. The County has installed four public stations at the Justice Center Parking Deck, and two each at Main Library, Human Services, South Library, and North Library.

---

1 In 2007, the City of Durham and Durham County adopted a the “Greenhouse Gas and Criteria Air Pollutant Emissions Inventory and Local Action Plan for Emissions Reduction”, which sets the goal of reducing greenhouse gas emissions by government by 50% and the community by 30% from 2005 levels by 2030.
Charging Technology and Cost
The main determining factors of how long it will take to fully charge a vehicle is the design of the vehicle and the type of charging station. As vehicle design evolves, they will be able to go further on a shorter charge.

There are currently three types of PEV charging stations available for consideration. Level I uses a standard 120V AC (voltage of alternating current) outlet and can provide enough charge for approximately 40 miles of driving range with 8-10 hours of charging. This is likely to be suitable for overnight charging and may be suitable for workplace charging. Level II chargers are similar in power to 240V AC clothes dryer outlets and can provide enough charge for approximately 80 miles of driving range in 6-8 hours. These are appropriate for home or public charging stations.

DC (direct current) fast charge stations are much higher power connection that can charge a typical battery to 80% capacity in only 20-30 minutes. These draw a lot of electricity when in use and also can decrease battery life. They are most appropriate when options for when a slower charge are not feasible, such as long distance trips or emergency situations.

<table>
<thead>
<tr>
<th>Charger Type</th>
<th>Power requirements: Voltage (Amperage)</th>
<th>Power Supply</th>
<th>Charge Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I</td>
<td>120V AC (15A)</td>
<td>Standard three-pronged outlet</td>
<td>16-20 hours (~80 miles)</td>
</tr>
<tr>
<td>Level II</td>
<td>240V AC (Up to 80A, typically 30A)</td>
<td>Dedicated hardware with standard vehicle connection</td>
<td>6-8 hours (~ 80 miles)</td>
</tr>
<tr>
<td>DC Fast Charge</td>
<td>480V DC (80-100A)</td>
<td>Dedicated hardware with non-standard vehicle connection</td>
<td>20-30 min (~80% of battery capacity)</td>
</tr>
</tbody>
</table>

Due to cost and time constraints, most public charging stations will likely be Level II, 240-V AC stations. These stations can provide enough charge to satisfy most citizens’ daily commute in 3-4 hours and cost about $3,000-$5,000 each (depending on chosen features and additional material costs). Labor costs are variable depending on site-specific requirements. Factors that affect labor costs include: distance to connect to electric infrastructure, ability of current electric utility to provide additional power at that location, physical obstructions between the charging station location and electricity infrastructure, installation method (e.g. on a pedestal, pole, or wall) and the level of physical protection (e.g. bollards) required.

At an electricity cost of $0.10/kWh, charging a Nissan Leaf or Chevy Volt for four hours at Level II would provide approximately 40 miles of driving range for under $1.50. Future vehicles, such as the Ford Focus EV expected to go on sale in 2012, will likely recharge their batteries at twice that rate, providing approximately 80 miles of range for under $3.00 in the same four hours. Several charging stations with a modest electric vehicle fleet would incur energy costs of

---

December 2011

Page 2 of 10
just a few hundred dollars annually. The North Carolina Utilities Commission restricts the sale of electricity, therefore we could not charge users for the electricity that they use on City or County-owned charging stations. It would be possible to generate revenue by charging for parking spaces, using metered parking, permit fees, etc., but in the short term the cost of recovering those funds would exceed revenue. However, it is important to plan for these options in the future when stations might be used more extensively.

**Electric Vehicle Charging Station and Plug-In Electric Vehicle Plan**

**Objective 1 – City and County Operations:** Provide electric vehicles and electric vehicle charging stations (EVCS) for City and County operations.

**Initiative 1.1 Assign Responsibility to Departments**

A. The City Manager will designate a City department as the lead agency responsible for implementing Electric Vehicle Charging Stations (EVCS) policies and practices related to City operations. Foreseeable departmental roles:

1. Transportation – manage 3rd party contract for collection of fees once the City begins to charge for use of EVCSs (likely at least 5 years out)
2. Sustainability – Oversight of policy development and annual review, strategic planning, outreach and education, maintain list of current and future stations, coordinate with other entities in Durham that own or plan to install EVCSs
3. General Services – maintain City-owned EVCSs, plan for future charging stations by installing conduit and properly sized electrical panels during new construction/major renovation
4. Public Works – evaluate capital improvement projects for roads and/or sidewalks to determine if conduit can be placed within the limits of the project, after a funding source has been identified for the additional design and construction costs that will be associated with this work
5. Inspections – provide information to property owners on EVCS installation requirements, inspect EVCSs as appropriate, provide information on EVCS inspections to the City-County Sustainability Manger, permitting
6. Fleet Management – Purchase and maintain electric vehicles in the City Fleet, maintain EVCSs
7. Planning – Review site plans (where required), permitting
8. Fire Department – Remain trained and up to date on first responder protocols for PEVs and EVCSs.

B. The County Manager will designate a County department as the lead agency responsible for implementing EVCS policies and practices related to County operations. Foreseeable departmental roles:

1. General Services – maintain County-owned EVCSs, oversee electric vehicle purchase and maintenance
2. Engineering – plan for future charging stations by installing conduit and properly sized electrical panels during construction/major renovations

3. Sustainability – Oversight of policy development and annual review, strategic planning, outreach and education, maintain list of current and future stations, coordinate with other entities in Durham that own or plan to install EVCSs

4. Inspections – provide information to property owners on EVCS installation requirements, inspect EVCSs as appropriate, provide information on EVCS inspections to the City-County Sustainability Manager, permitting

5. Planning – Review site plans (where required), permitting

C. Given the rapidly changing nature of electric vehicles supply and demand, the City-County Sustainability Manager should review the Electric Vehicle Charging Stations and Plug-In Electric Vehicle Plan (“Plan”) annually and update as needed. This update shall include an analysis of the staff and other resources needed to continue the work as defined in the Plan.

Initiative 1.2 Install EVCS Facilities. The City and County will install Level II EVCSs for fleet use, as funding becomes available and vehicles are purchased.

Initiative 1.3 Purchase Electric Vehicles.

A. The City Fleet Manager will purchase plug-in electric vehicles and assign them to departments for regular use, where appropriate.

B. The County Fleet Management/Inventory Coordinator shall evaluate vehicle requests to see if they could be fulfilled by purchasing and electric vehicle and will work with the affected department to purchase electric vehicles, as appropriate.

Initiative 1.4 Adopt Policies. The City Manager and County Manager will revise existing relevant policies or adopt new policies for use of PEVs and EVCSs by employees, as vehicles are purchased and EVCSs are installed.

Objective 2 – Standards and Barriers: Establish standards for and remove regulatory barriers to public and private EVCS facilities in Durham.

Initiative 2.1 Site Selection and Design Criteria. Establish a set of criteria to guide the location of future publicly funded EVCSs, including public safety, convenience, proximity to utility service, siting standards, signage and visibility, handicapped access, public interest, etc.

A. Safety: Chargers should be sited away from traffic and other hazards. Adequate lighting should be provided for security. By siting the stations in well lit areas this will provide safety and cut down on the potential for vandalism.
B. **Convenience:** Chargers should be located conveniently near the main building or facility, whenever possible. The PEV owner should have easy clear path to the EVCS. Check with the City of Durham Public Works Department, City of Durham Transportation Department and/or the NC Department of Transportation for placement on public right of ways.

C. **Proximity to Utility Equipment:** Site charging stations near the facility’s electrical panel, or near the electric utility’s feeder lines or transformers, whenever possible, to reduce installation costs. In general, the closer the EVCS is to the power source the less expensive and time-consuming the installation process will be.

D. **Proximity to Communication Infrastructure:** Data collection is pertinent to the EVCS program. Data is collected for reporting purposes, management of the system, monitoring usage and location coordination. Data can be collected wirelessly via Wi-Fi but the preferred method is directly tied into an intranet connection. The conduit needed for the power source will be larger than the conduit for the communication service.

E. **Cable Management:** To avoid injury from tripping over cables, cords and cables should not cross sidewalks or pedestrian traffic patterns, and should be installed with the PEV user's convenience in mind. Cable retractors should be considered for permanently wired cables. This will also help to prevent the cable from potential damage.

F. **Potential Hazards:** Ensure that PEV charging spaces are not located near potential hazards.
   i. EVCS should not be installed near explosive material; flammable vapors, liquids and gases; combustible dust or fibers; and materials which ignite spontaneously on contact with air.
   ii. EVCS installation will comply with all current, or amended, National Electrical Codes (NEC). If charge stands are installed in an enclosed area, check ventilation requirements.
   iii. EVCSs shall not be located in special flood plain hazard areas or areas prone to flooding in a rain event.

G. **Protection:** Curbs, wheel stops, bollards and setbacks should be provided so that PEVs or other vehicles cannot inadvertently drive into the EVCS. When installing curbs, wheel stops, bollards and setbacks, consider ease of access to the charger, mobility of users and foot traffic in the area.

H. **Visibility:** EVCSs should be made as visible as possible so they are easy to find. This can be achieved through signage, additional lighting, location, poles, etc. Signs may be needed to designate parking spaces for PEV-use only. These signs should be positioned 7 feet above grade.
I. Disabled Access: At least one EVCS at each location should be sited where it can be accessed from a space sized to accommodate a handicapped accessible van, until clear guidance is issued from the NC Department of Insurance (NCDOI). This space does not have to be restricted to handicapped accessible vehicles, but it should be at least 16 feet wide (can be 11 foot stall with 5 foot access aisle or 8 foot stall with 8 foot aisle) with appropriate access to the EVCS.

Initiative 2.2 ADA Requirements. Currently NCDOI does not have a set of guidelines or requirements for ADA compliance when installing EVCSs. The City-County Inspections Department should prepare draft set of standard for handicapped access to EVCSs to propose to the NCDOI & NC Building Codes Council.

Initiative 2.3 Inspections Expertise. The City-County Inspections Department will ensure that at least one if its electrical inspectors is knowledgeable in building code issues related to EVCS, so that potential developers can get correct and timely information.

Initiative 2.4 Site Plan Requirements. The City-County Planning and Inspections departments will draft a set of standards to determine when a site plan approval is required for new EVCSs installations. Plan requirements may include bollards, compact sites, ADA requirements, etc.

Objective 3 – Infrastructure: Provide EVCS infrastructure for citizens of Durham City and County.

Initiative 3.1 Publicly Accessible Charging Facilities. The City and County will provide publicly accessible Level II EVCS facilities at strategic locations around Durham.

Initiative 3.2 Future EVCS Facilities Planning. The City and County will identify locations for future EVCS facilities around Durham County, focusing on locations where people tend to spend at least an hour and that draw visitors from at least 25 miles away.
   A. Prepare and maintain a list of priority locations for future publicly funded installations of EVCSs.
   B. Apply for grant and other funding to pay for EVCS purchase and installation.
   C. Encourage commercial property owners to install publically accessible EVCSs on their property.

Initiative 3.3 Infrastructure for Future Facilities.
   A. The City and County will incorporate EVCSs or conduit for EVCSs in construction of new public facilities and parking facilities, including public streets, when budgets permit and when locations meet Site Selection Criteria.
   B. The City and County will install conduit for future EVCS sites when performing regular maintenance/construction of roads, sidewalks, parking lots, etc. when budgets permit and when locations meet Site Selection Criteria. This includes conduit for electrical and data collection infrastructure.
Objective 4 – Public Information: Provide public education and information about electric vehicles, EVCSs, and standards.

Initiative 4.1 EVCS Facilities Map.
A. The City-County Sustainability Manager will prepare and maintain an on-line map that shows present and proposed publicly accessible EVCSs in Durham and surrounding areas, using information from local, state, and federal sources.
B. The City-County Sustainability Manager will report new EVCSs to the Triangle Clean Cities Coalition for inclusion in regional and national databases and maps of EVCSs.
C. The City-County Sustainability Manager will provide information on City and County owned, publically-accessible EVCSs to area dealerships that sell PEVs.

Initiative 4.3 Publicizing Electric Vehicle Use. The City and County Public Affairs Offices will, as appropriate, publicize the City and County’s use of PEVs and availability of EVCSs through press releases, press events, and DTV8 programming.

Initiative 4.4 Signage. When financially viable, the City and County will include signage or other marketing/awareness material at the site of new EVCSs. This material should include information on the benefits of charging PEVs during off-peak hours, whenever possible.

Initiative 4.5 Electric Vehicle Graphics. When financially viable, the City and County will include art, graphics, and/or text on fleet PEVs that educate the public on the benefits of using all-electric vehicles. This could include vehicle wraps, magnets, logos, etc.

Policy Recommendations

Policy Objective 1 – City and County Operations.

Measures: At least once a year, track and review actual use and operating costs of fleet PEVs and analyze cost/benefit of the program.

After 1 year of owning and operating PEVs and EVCSs, the City and County will evaluate vehicle use and charging station use and analyze cost of operation. Based on this analysis, the City and County will establish goals for converting a certain portion of the vehicle fleet to PEVs and installing a certain number of EVCSs within a certain number of years. This goal will be reevaluated annually.

Policy 1.1 Fleet Electric Vehicles.

a. The City and County will revise existing fleet replacement policies to include purchases of PEVs as opportunities arise and as budgets permit if cost/benefit analysis shows they are competitive with conventional vehicles.
b. The City Fleet Manager and County Fleet Management/Inventory Coordinator will be responsible for performing a usage feasibility study before gasoline powered vehicles are replaced with PEVs. Feasibility study may include mileage/usage study, evaluation of proximity to charging infrastructure, type of function performed by the vehicle, etc.

c. The City Fleet Manager will review annually the maintenance needs of the City PEV fleet and determine the cost effectiveness of performing maintenance in-house versus contracted out.

**Policy 1.2 Fleet Electric Vehicle Charging Stations.** The City and County will install EVCSs reserved for City and County fleets at locations deemed necessary as PEVs join the fleet.

**Policy 1.3 Electric Vehicle Charging.** Unless otherwise necessary, City and County staff will charge PEVs in off-peak hours as defined by Duke Energy.

**Policy 1.4 Cost of Electricity.** The City and County departments responsible for paying site utility bills will be responsible for paying for the cost of electricity used by EVCSs at that site.

**Policy 1.5 Expertise.** At least 1 electrician for the City and County will be knowledgeable about the installation and maintenance of EVCSs.

**Policy Objective 2 – Standards and Barriers.**

**Measures:**

a. Within 90 days, the City-County Inspections Department will train at least 1 electrical inspector in applicable building codes for EVCSs.

b. Within 90 days, the City-County Inspections Department will prepare a draft set of standards to the NCDOI regarding ADA compliance for EVCS installations.

**Policy Objective 3 – Infrastructure.**

**Measures:** At least annually, the City-County Sustainability Manager will analyze use data for public EVCS to determine if additional stations are needed and if it is financially viable to bill for use. After 1 year pilot of having public EVCSs, the City and County will establish goals for providing a certain number of publically-available EVCSs within 5 years throughout Durham.

**Policy 3.1 Billing.**

a. Until financially viable, the City and County will not bill for use of public EVCSs.

b. The City and County will evaluate EVCS use annually and determine when it is financially viable and in the best public interest to charge for use of public EVCSs.

**Policy 3.2 Regulation.** The City and County may regulate the use of City and County owned EVCS infrastructure by means of time limitations, ticketing, signage, etc.
**Policy 3.3 Incentives.** The City and County will consider incentives to encourage commercial property owners to install publically accessible EVCSs in areas that have been identified as priority locations.

---

**Priority Locations for Future Installation of Publicly Accessible EVCSs**

This is a list of locations that the City and County has identified as potential good candidates for future publically-owned and commercially-owned EVCSs.

**Priority of Potential Public Station Locations**

1. Durham Performing Arts Center
2. Museum of Life & Science
3. Heavily used Parks and Rec site?
4. Downtown City Parking Garages
5. Durham Regional Hospital
6. Future parking decks
7. Eno River State Park

**Priority of Potential Commercial Station Locations**

1. NCCU
2. Durham Tech
3. Southpoint Mall
4. Northgate Mall
5. 9th Street
6. Around future light rail stations and in transit oriented development zones
7. Brightleaf Square
8. Future parking decks
9. Apartment complexes
List of City and County Facilities

1. Durham County Justice Center Parking Deck (County)
   S. Roxboro St. and S. Dillard St.
   Two level II stations on each of parking level 1 and 3

2. Durham County Human Services Complex (County)
   400 E. Main St.
   Two level II stations in public parking lot

3. Durham County Main Library (County)
   300 N. Roxboro St.
   Two level II stations in public parking lot

4. South Regional Library (County)
   4505 S. Alston Ave.
   Two level II stations in public parking lot

5. North Regional Library (County)
   221 Milton Rd.
   Two level II stations in public parking lot

6. Goldenbelt (City)
   800 E. Main St.
   Two level II stations in parking lot

7. City Hall Annex parking deck (City)
   101 City Hall Plaza
   Two level II stations for fleet use only

A map of these locations and other commercially-owned public stations can be found at www.GreenerDurham.net. (http://g.co/maps/23npr)
APPENDIX I

DOE Sample Plan Outline for PEV Readiness Planning
APPENDIX 1 – SAMPLE PLAN OUTLINE

At a minimum, completed plans should consider the following elements:

1. Documentation demonstrating a substantial partnership with relevant stakeholders, which may include:
   a. State, local, and tribal governments;
   b. all relevant generators and distributors of electricity and utility regulatory authorities;
   c. as appropriate, owners and operators of regional electric power distribution and transmission facilities;
   d. departments of public works and transportation;
   e. owners and operators of property that will be essential to the deployment of a sufficient level of publicly available charging infrastructure (including privately owned parking lots or structures and commercial entities with public access locations);
   f. plug-in electric drive vehicle manufacturers or retailers;
   g. third-party providers (such as vendors, installers, etc.) of charging infrastructure or services;
   h. fleet(s) that will participate in the program;
   i. Clean Cities Coalitions

2. A clear description of the role and responsibilities of each stakeholder; and a plan for continuing the engagement and participation of the stakeholders, as appropriate, throughout the implementation of the plan. This includes engagement of major fleet operators to encourage electrification of fleets such as taxis, municipal operations and delivery vehicles.

3. Analysis of barriers to the implementation of plug-in electric vehicles and infrastructure in your proposed area and a discussion of steps to reduce or eliminate the identified barriers.

4. Current plans for plug-in electric drive vehicle deployment in the area/region covered by the plan including:
   a. the number of plug-in electric drive vehicles anticipated to be plug-in electric drive privately owned personal vehicles; a justification should be provided for these estimates
   b. the number of plug-in electric drive vehicles anticipated to be privately owned fleet or public fleet vehicles; a justification should be provided for these estimates
   c. An analysis of usage patterns of vehicles

5. A plan for deploying residential, workplace, private, and publicly available charging infrastructure, including
   a. primary and secondary potential charging locations:
      o an estimate of the number of consumers who will have access to private residential charging infrastructure in single-family or multifamily residences;
      o an estimate of the number of consumers who will have access to workplace charging infrastructure;
   b. a plan for ensuring that the charging infrastructure or plug-in electric drive vehicle be able to send and receive the information needed to interact with the grid and be compatible with smart grid technologies to the extent feasible
   c. a plan that identifies and addresses the unique challenges of installing infrastructure at multifamily residential buildings:
   d. an estimate of the number and location of publicly and privately owned charging stations that will be publicly or commercially available;
   e. an estimate of the number and location of charging infrastructure that will be privately funded or located on private property;
   f. an estimate of the potential costs associated with EVSE deployment and potential sources of funding.
6. Descriptions of updated building codes (or a plan to update building codes before or during the grant period) to include charging infrastructure or dedicated circuits for charging infrastructure, as appropriate, in new construction and major renovations; EVSE must be commercially available (i.e. pre-commercial demonstration or research & development components are not desirable). “Commercially Available” EVSE is defined as equipment that is available for purchase and unrestricted operation by the general public and are fully compliant with all applicable standards and safety regulations (ex: SAE, UL Listing or equivalent) and will be installed by a certified electrician.

7. Descriptions of updated construction permitting or inspection processes (or a plan to update construction permitting or inspection processes) to allow for expedited installation of charging infrastructure for purchasers of plug-in electric drive vehicles, including a permitting process that allows a vehicle purchaser to have charging infrastructure installed rapidly (24 - 48 hours is a suggested target goal for private residential applications or permit by notification);

8. Descriptions of updated zoning, parking rules, or other local ordinances as are necessary to facilitate the installation of publicly available charging infrastructure and to allow for access to publicly available charging infrastructure, as appropriate. Also attention should be given to compliance American with Disabilities Act if applicable;

9. A plan for effective marketing, outreach, training, and education relating to plug-in electric drive vehicles, charging services, and infrastructure; the plans should include specialized training and education necessary to ensure that vehicles and related electric charging equipment is installed, maintained, and operated in a safe and proper manner. This could include training for electric charging point users, first responders, public safety officers, inspectors, installers, and construction permitting officials in areas where electric charging is being introduced, among other target audiences.

10. An assessment and plan to communicate available or anticipated benefits or incentives for plug-in vehicle owners; and identify and establish other potential needed or desired benefits or incentives. These may include:
   a. rebates of part of the purchase price of the vehicle;
   b. state and federal tax incentives/credits
   c. reductions in sales taxes or registration fees;
   d. rebates or reductions in the costs of permitting, purchasing, or installing home plug-in electric drive vehicle charging infrastructure; and
   e. rebates or reductions in State or local toll road access charges;
   f. additional consumer benefits, such as preferred parking spaces or single-rider access to high-occupancy vehicle lanes for plug-in electric drive vehicles;

11. A description of utility, grid operator, or third-party charging service provider, policies and plans for accommodating the deployment of plug-in electric drive vehicles, including--
   a. rate structures or provisions and billing protocols for the charging of plug-in electric drive vehicles;
   b. analysis of potential impacts to the grid;
   c. plans to minimize the effects of charging on peak loads;
   d. A proposed plan for making widespread utility and grid upgrades;
WAIVER OF LIABILITY
The NC PEV Taskforce, Mountains to Sea partners, and Advanced Energy make information available to enhance public knowledge. The information in this guide is provided “as is” and at your own risk. The NC PEV Taskforce, Mountains to Sea partners, and Advanced Energy do not make any representation or warranties of any kind, express or implied, about the accuracy, suitability for any purpose, merchantability of, title to or usefulness of the information in this guide.

By using this guide, you agree that you are solely responsible for all damages or injury that may result from or be caused by such use. The NC PEV Taskforce, Mountains to Sea partners, Advanced Energy, its agents and employees shall not be liable to you or other third parties for any damages (including special, indirect, consequential, or incidental damages or damages for loss of profits, revenue, or loss of use) arising out of or relating to the information contained herein whether such damages arise from mistakes, errors, omissions or interruptions.

PERMISSION TO USE COPYRIGHT INFORMED
Permission is hereby granted to use, copy and distribute copies of this Guide for internal, personal, informational commercial and non-commercial use, provided that the above copyright notice and this permission notice appear in any copy of the Guide and proper authorship is acknowledged.