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 goals[1]. 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.

Charger Type	Power requirements: Voltage (Amperage)	Power Supply	Charge Time
Level I	120V AC (15A)	Standard three-pronged outlet	16-20 hours (~80 miles)
Level II	240V AC (Up to80A, typically 30A)	Dedicated hardware with standard vehicle connection	6-8 hours (~ 80 miles)
DC Fast Charge	480V DC (80-100A)	Dedicated hardware with non-standard vehicle connection	20-30 min (~80% of battery capacity)

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

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 Manger, 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)