



**NC CLEAN ENERGY**

TECHNOLOGY CENTER

# Getting North Carolina Ready for Electric Vehicle Charging

APRIL 2022

**NC STATE UNIVERSITY**



## SUMMARY

Electrification of transportation is exciting and challenging. Market forces are already pushing us in the direction of electric vehicles, but our electric “refueling” infrastructure is lagging. Investments are being made and more are coming in the form of grants, incentives, and substantial federal investments. **Our challenge here in North Carolina is to prepare now for this influx of funding, to ensure we are ready for it, and that we use it effectively and efficiently.** This guidance document helps the reader understand how to get ready and where to find detailed guides for different aspects of building the new EV charging infrastructure.

## How to Get North Carolina Ready For The Electric Vehicle Revolution

Automobile manufacturers are announcing their electric vehicle (EV) production plans on nearly a daily basis. Within a very short period of time, there will be a wide variety of EVs in the showrooms of every major brand. Cars, trucks, and SUVs powered by electric motors and rechargeable batteries will soon be available for purchase by consumers in North Carolina and the rest of the US. Even fleets have expanding EV options as electric school buses, transit buses, LTVs, and medium- and heavy-duty work trucks become truly commercialized. Will North Carolina be ready with the public EV charging infrastructure that electric vehicle buyers need to feel comfortable with the idea of owning and traveling with an EV?

### **For homeowners, charging is typically easier than for apartment dwellers**

Most North Carolina EV owners who own their own homes have off-street parking and will have no problem charging their EV’s batteries with a charger or cord installed at their residence. These people can charge each night and be ready to go the next day with a full charge.

### **What about drivers without dedicated off-street parking, apartment and condo dwellers, or those taking a long trip?**

Most apartment, townhome, and condo dwellers in North Carolina don’t currently have a place to charge where they live. Many homeowners in dense neighborhoods lack off-street parking and the ability to charge. Also, those EV owners who need to travel beyond the range of their EV’s battery also face difficulty finding a place to charge along the way.



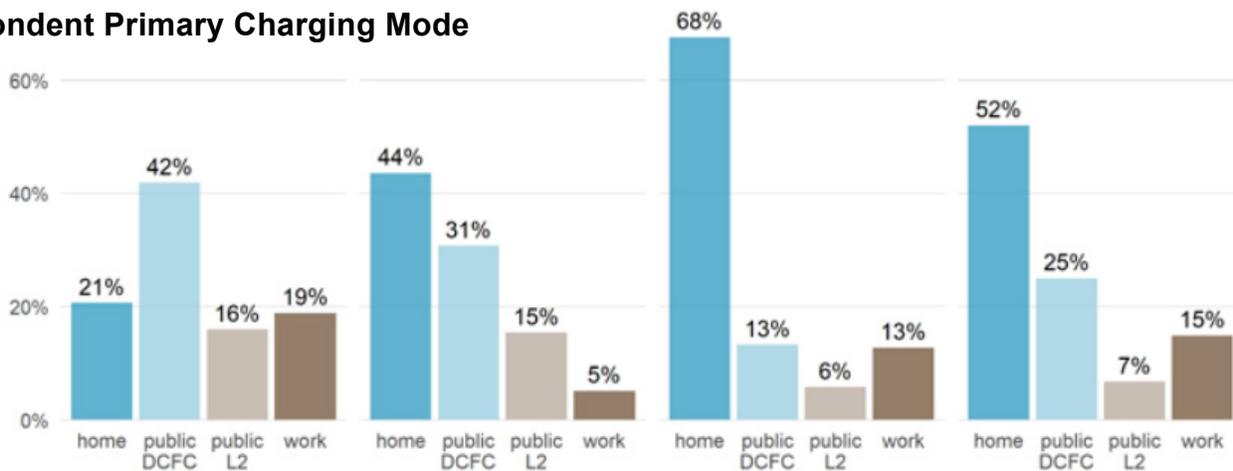


**North Carolina-Focused: Locally Sourced Guides**

Look out for this icon to find four locally produced guides, which are based on specific circumstances and regulations within the state of North Carolina.

However, public charging can provide a charging option for both of those use cases. A recent study from the University of California – Los Angeles found that drivers who live in multi-family housing largely rely on DC fast chargers.<sup>1</sup> Another report from the International Council on Clean Transportation reached a similar conclusion, that EV-owning apartment dwellers in the U.S. rely primarily on public charging sites.<sup>2</sup>

**Respondent Primary Charging Mode**



**Charging at work is a breeze**

While most EV charging happens at places of residence, workplace charging is also very important. According to the U.S. Department of Energy, people who are able to charge at work are six times more likely to drive an EV than those without the option.<sup>3</sup> Workplace charging especially helps EV drivers who don't have access to home charging, or whose commute is long. Workplace charging can also help businesses attract and retain talent, improve employee productivity, and achieve sustainability goals—typically at very little or no cost to the workplace. In sum, ensuring access to charging at long dwell-time locations, like workplaces, is even more important for drivers without access to dedicated overnight parking and will become increasingly important as managed charging and bidirectional charging become more widespread.

<sup>1</sup> University of California at Los Angeles, Luskin Center for Innovation, Evaluating Multi-Unit Resident Charging Behavior at Direct Current Fast Chargers, January 2021, available at <https://innovation.luskin.ucla.edu/wp-content/uploads/2021/03/Evaluating-Multi-Unit-Resident-Charging-Behavior-at-Direct-Charging-Behavior-at-Direct-Current-Fast-ChargersCurrent-Fast-Chargers.pdf>

<sup>2</sup> International Council on Clean Transportation, Quantifying the Electric Vehicle Charging Infrastructure Gap Across U.S. Markets, January 2019, page 9; available at [https://theicct.org/sites/default/files/publications/US\\_charging\\_Gap\\_20190124.pdf](https://theicct.org/sites/default/files/publications/US_charging_Gap_20190124.pdf)

<sup>3</sup> US Department of Energy, "Workplace Charging Challenge Progress Update 2016" [https://www.energy.gov/sites/prod/files/2017/01/f34/WPCC\\_2016%20Annual%20Progress%20Report.pdf](https://www.energy.gov/sites/prod/files/2017/01/f34/WPCC_2016%20Annual%20Progress%20Report.pdf)



*“As we transition our own fleets to electric, there is an opportunity to share the responsibility and create public / private partnerships that benefit our fleets and can also be used by the public. Local governments will own some EV infrastructure for our fleets, but just like gas stations, we also rely on private infrastructure— especially for our longer route vehicles and/or those on the outskirts of town. This is something we’re working on in Raleigh.”*

—Megan Anderson, Sustainability Manager, City of Raleigh.

### Public EV charging infrastructure is a pressing need

Creating more publicly available EV charging stations will help increase confidence of those considering buying electric vehicles. As beneficial for the environment as EVs may be, there are currently some significant limitations in the area of EVSE availability and convenience:

- It takes longer to charge an EV than it does to gas up a conventional car (although charge times are declining as technologies advance).
- The quantity of public EV charging stations is nowhere near that of gas stations.
- Not all EV charging stations are compatible with different types of EVs that can charge at them (i.e., CCS Combo, J1172, Tesla, and ChaDeMO).
- Not all EV charging stations are compatible with different payment systems, which may present friction for some users.
- Some stations may be closed, not working, or in use when a driver arrives to recharge.

Building and installing more well-planned EV chargers helps solve all these problems.

### The state of EV charger deployment in North Carolina

According to a recent study of EV and EVSE deployment in the Southeastern states, North Carolina is ranked behind Georgia and Florida in EV charging ports per 1,000 people.<sup>4</sup> In another study from 2018, the Tarheel State was ranked 10th in the nation in total deployed charging stations but only 30th in charging stations per capita.<sup>5</sup>

Currently, there are 979 publicly available EV charging stations throughout NC, with most counties having fewer than 20. Areas with higher concentrations of charging stations are mostly clustered around the Raleigh-Durham and Charlotte metropolitan areas. Of these 979 stations, only 451 are DC Fast charging stations. Altogether, between public Level 2 and DC Fast, there are only 2,361 ports in North Carolina.

#### Accessibility for Public Charging Stations, Version 2.0, November 2014

This guide, produced by Advanced Energy, is based on international, Federal, and North Carolina codes and standards governing both EVSE installation and guidelines for accessibility under the ADA.

[LEARN MORE →](#)

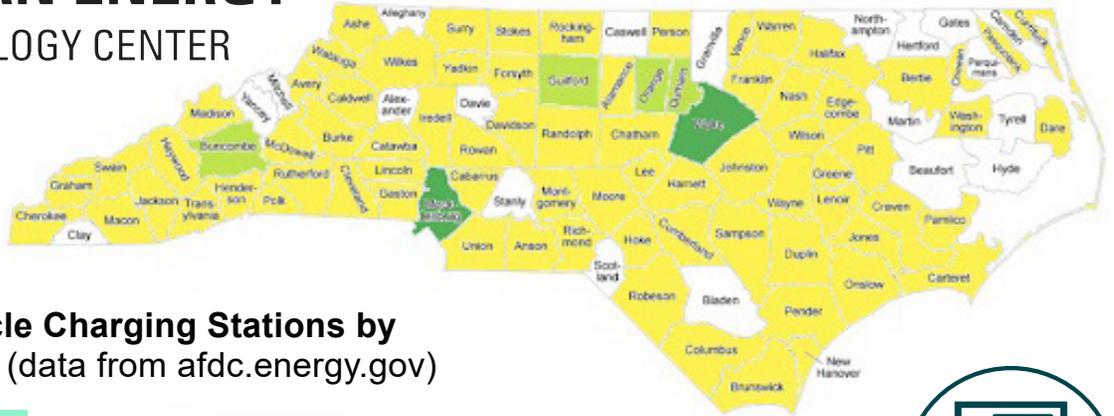
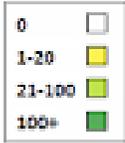


<sup>4</sup> Transportation Electrification in the Southeast, Atlas Public Policy, August 2021, <https://atlaspolicy.com/wp-content/uploads/2021/08/Transportation-Electrification-in-the-Southeast-2021.pdf>

<sup>5</sup> Which States Love Electric Vehicles the Most? James McCrea, October 03, 2018, <https://www.yourmechanic.com/article/states-electric-vehicles>



# NC CLEAN ENERGY TECHNOLOGY CENTER



## Installed Electric Vehicle Charging Stations by North Carolina County (data from afdc.energy.gov)

Bottom line? It is essential that an expanded focus by vehicle manufacturers to produce more EVs is complemented by a similarly rapid expansion in EV charging around the country. And if North Carolina is to meet our ambitious goal of 1.25 million EVs by 2030, we must accelerate our deployment of all types of EV charging stations.

### The good news is that help is on the way!

Efforts are underway across the state to increase the density of charging stations in the hopes of encouraging an increase in both public and private use of electric vehicles. Some recent developments have done much to boost the pace of public EV charging infrastructure deployment. One is the Volkswagen diesel emissions scandal consent decree, aka the VW Settlement, which has provided \$2 billion to promote EV use in the US through the end of 2026. The Electrify America EV charging system plans to draw on these funds to build out a network of charging stations across the US that will ultimately be located within 70 miles of each other.

## Charging Station Handbook for Electrical Contractors and Inspectors, Version 4.0, November 2014



This handbook, produced by Advanced Energy, includes overviews, guidelines and checklists to help contractors and inspectors deal with requests relating to EVSE. A sampling of topics covered:

1. Charging Levels
2. Codes & standards
3. Installation locations
4. Installation preparation
5. Charging station selection
6. Installation & Inspection

[LEARN MORE →](#)

Another tailwind for EV charging development has come from the incoming Biden administration, which strongly supports the switch to EVs as well as an accelerated buildout of the EV charging system nationwide. This is now a national “green infrastructure” priority, with numerous grants, tax credits, and rebates available – and much more likely to be added. The Bipartisan Infrastructure Law includes \$7.5 billion to deploy a nationwide network of 500,000 EV chargers. \$5 billion of this will be made available under the National Electric Vehicle Infrastructure (NEVI) Formula Program.

For North Carolina, most of these funds will be administered through NCDOT. So, the state is well-positioned to see a dramatic increase in EV charging developments. Additional tools, such as commercial EV electricity rates, and Duke Energy’s make-ready program, are other ways that North Carolina will leverage private sector investment in EV infrastructure.

**Our challenge here in North Carolina is to prepare now for this influx of funding, to ensure we are ready for it, and that we use it effectively and efficiently.**



## Multifamily Electric Vehicle Charging Guide

This guide from Plug-in NC takes you through the process of creating EV charging stations for multifamily communities:

1. Finding a location
2. Assessing your electrical access
3. Selecting charging equipment
4. Preparing for installation
5. Developing policy & etiquette guidelines
6. Promoting the stations & educating residents

LEARN MORE →

### North Carolina is doing its part

In North Carolina, there is much being done at the state and local levels. Governor Cooper's Executive Order 246 (EO246) sets an ambitious goal of 1.25 million zero emission vehicles on NC roads by 2030. In 2019, the North Carolina Clean Energy Technology Center (NCCETC) provided \$2.8 million in grant funds through the Clean Fuel Advanced Technology (CFAT) Project.

The CFAT program helped fund 11 electric vehicle charging station projects, delivering 53 new Level 2 EV charging ports (28 of which are replacements of defunct equipment), 16 solar-powered EV charging ports and 4 new DC Fast Charge ports (at two stations). Read more about these projects (and others) [here](#).

In addition, NC Department of Environmental Quality (DEQ) has awarded more than \$3.8 million in funds to EV charging infrastructure as a part of the VW settlement. A total of \$422,000 was awarded for Level 2 charging in February of 2021, resulting in 96 ports at 29 locations, and \$3,434,974 was awarded for DC Fast chargers in July of 2020, resulting in 48 ports at 32 locations. In December 2021, NC DEQ issued their plan for VW Phase 2, and you can learn more about how they will utilize the remaining funding online by clicking [here](#).

Duke Energy is also part of the Electric Highway Coalition, a group of six regional utilities that plan a network of charging stations along the major highways that connect the South, Gulf Coast, Midwest, and Central Plains.

Duke Energy is also well on their way to deploying a \$25 million plan which includes the installation of 160 public Level 2 and 40 public fast-charging stations at 20 locations. In its 2020 decision authorizing this funding, the North Carolina Utilities Commission also ordered future programs to consider more ways to leverage private sector investment such as make-ready programs.<sup>6</sup>

In addition to Duke Energy, member-owned electric cooperatives in the state have been accelerating their own investments in Level 2 and DC fast charging stations. NC electric coops are making these investments both independently and in partnership with NC DEQ's VW settlement program.

<sup>6</sup> Order Approving Electric Transportation Pilot, In Part, November 24, 2020, <https://starw1.ncuc.net/NCUC/ViewFile.aspx?id=f0f2e564-51fa-46fb-a156-5b04f301db0f>



# NC CLEAN ENERGY

TECHNOLOGY CENTER

**It's a start, but much more must be done – here are the tools we need!**

A successful switchover from internal combustion engine (ICE) vehicles to EVs will take time, but there is plenty that can happen now at the local level. For all the North Carolina planners, code enforcement officials, sustainability officers, grant writers, public works staff, fleet managers, and parking administrators out there, we have some excellent planning and execution tools that you can use to get the results that we all need.

*“Where can I charge my car while towing a trailer?”*

*“Electric motorcycles are growing in popularity, but they take up a whole space— can we plan sites better to allow bike-sized spaces?”*

*“Electric box trucks, delivery vans, and medium-duty work trucks will also need to be charged— how do we plan for them?”*

## ***The Guide to the Guides***

**Is Your Complete Handbook to Municipal EV Charging Resources**



After reviewing numerous guides for local governments on the complexities of EV chargers and deploying them, we think we've found the best single resource. The Cadmus Group, in collaboration with the US Department of Energy procurement team, has developed *Fleets for the Future: Guide to the Guides – Municipal EV Charging Resources*. This 28-page document is a curated collection of highly practical EV charging guides, tools, and procurement contracts that can help with municipal EV charging strategies and EVSE procurement.

Fleets for the Future is a U.S. Department of Energy-funded aggregate procurement initiative that aims to reduce the cost of deploying alternative fueled vehicles and associated infrastructure (e.g. EV charging stations) for public fleets nationwide. It has developed EVSE contracts that can be leveraged via rider clauses by any public or nonprofit fleet through Sourcewell, a cooperative purchasing program that serves government, education and nonprofit organizations.

*Fleets for the Future: Guide to the Guides* has been designed as a quick reference resource to provide an orientation to EV charging guides and tools that can help with EV infrastructure planning. This includes strategies for direct public investment in EVSE, policy formation to support EV charging network development, and opportunities for collaboration with utilities on EV charging goals.



# NC CLEAN ENERGY TECHNOLOGY CENTER

The resources compiled in *Fleets for the Future: Guide to the Guides* may be useful for planning and zoning departments, municipal fleet managers and procurement specialists, utilities, and other stakeholders involved in hands-on implementation and policy efforts to increase EV and EVSE deployment. Expected use cases include:

- Selection of an appropriate tool for EV charging needs assessment
- Identification of EVSE procurement opportunities and suggested equipment specifications
- Education of stakeholder groups interested in further developing EV charging networks
- Identification of targeted resources for key aspects of EVSE implementation like siting and design
- The creation of multi-family or workplace charging programs

The document includes a list of 50 EV charging guides and a list of seven quantitative and spatial EV charging tools. The tables listing the resources are organized by highlighting how each resource can serve various information categories within three main EVSE deployment strategies.

Using the columns in the table included in *Fleets for the Future: Guide to the Guides*, users can quickly focus on EV charging guides that address their topics of interest most directly. Colored blue squares within the strategy grid indicate how in depth each category is covered within the corresponding document, with the darkest blue providing the most coverage.

Listings in the table include hyperlinks to the document, author, and year of publication. Summaries of each resource are also included below the table.

Preview the first part of the “List of EV Charging Guides” table on the next page. Find the full table starting on page 7 of *Fleets for the Future: Guide to the Guides*.

## There are other cooperative procurement programs that local governments should be aware of:

In collaboration with the Climate Mayors, Sourcewell offers special group-purchase contracts and lease arrangements for EVs and associated equipment. Also, the North Carolina Department of Administration and the NC Sheriff’s Association have favorable contract pricing and bid awards available to local governments.



## The following categories are used:

### Strategies for direct public investment



- Planning
- Siting & design
- Finances & operations
- Medium & heavy-duty vehicles

### Strategies for enabling EVSE growth



- EVSE incentives
- Soft costs
- Workplace/multifamily

### Strategies for utility coordination



- Utility policy
- Managing costs & grid impact



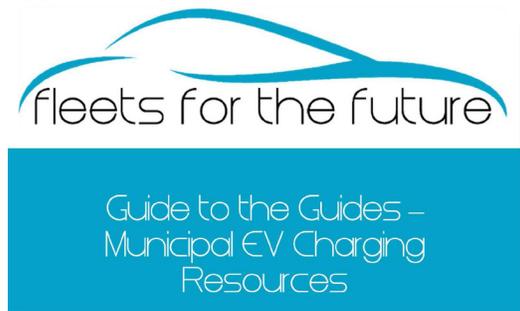
Legend: *Dark blue = covers this topic in depth, light blue = covers this topic, lightest blue = tangential, blank = not addressed*

Title	Author/ Organization	Year	Direct Public EVSE Investment				Enabling EVSE Growth			Utility Coord.
			Planning	Siting & Design	Finances & Operations	MDVs and HDVs	EVSE Incentives	Soft Costs	Workplace, Multi-family	Utility Policy
<a href="#">50 States of Electric Vehicles 2017 Annual Review</a>	NC Clean Energy Technology Center	2018					Dark Blue	Light Blue		Light Blue
<a href="#">Advanced Plug-in Electric Vehicle Travel and Charging Behavior Interim Report</a>	UC Davis	2017			Dark Blue		Lightest Blue			Lightest Blue
<a href="#">Best Practice Guides for Charging Stations (Collection of resources)</a>	NYSERDA									
<a href="#">Assessment of Current EVSE and EV Deployment: Electric Vehicle Supply Equipment Support Study</a>	NYSERDA	2012		Dark Blue						
<a href="#">Best Practices Guide for Site Owners of Electric Vehicle Charging Stations on Commercial Properties</a>	NYSERDA	2015	Dark Blue	Dark Blue	Light Blue			Light Blue		
<a href="#">Creating EV-Ready Towns and Cities: A Guide to Planning and Policy Tools</a>	NYSERDA	2012	Light Blue	Light Blue			Light Blue		Light Blue	
<a href="#">Electric Vehicle Charging Station Installers Best Practices Guide</a>	NYSERDA	2012	Dark Blue	Dark Blue	Dark Blue			Dark Blue		Dark Blue
<a href="#">EV-Ready Codes for the Built Environment: Electric Vehicle Supply Equipment Support Study</a>	NYSERDA	2012	Dark Blue					Dark Blue		
<a href="#">EVSE Cluster Analysis: Electric Vehicle Supply Equipment Support Study</a>	NYSERDA	2012		Dark Blue						
<a href="#">Lessons Learned from Early Deployment of Electric Vehicle Charging Stations: Case Studies from the Northeast and Mid-Atlantic Regions</a>	NYSERDA	2013	Dark Blue	Dark Blue	Dark Blue					

*Fleets for the Future: Guide to the Guides* also includes appendices that provide access to past Fleets for the Future webinars, as well as relevant podcasts on a variety of EV-related topics.

Also provided in these appendices are procurement resources which enable the purchases of EVSE at low cost. These cooperative purchasing contracts were developed through the Fleets for the Future project. Municipalities, state agencies, public and quasi-public agencies, other public entities such as libraries, schools, and hospitals, and nonprofits are all eligible to purchase the following products and services through these contracts:

- EVSE hardware (Level 1, Level 2, and DCFC)
- Maintenance
- Repair
- Parts
- Leasing
- Warranties
- Installation
- Networking
- Charging monitoring
- Billing
- Other related software services



**You can download the full 28-pages of *Fleets for the Future: Guide to the Guides* by clicking the link below.**





### Workplace Electric Vehicle Charging Guide

This Plug-in NC guide takes you through the steps of creating EV charging stations for employers:

1. Developing a charging strategy
2. Survey employees
3. Review electrical access & select parking spaces
4. Select charging stations
5. Hire a contractor
6. Install & inspect equipment
7. Add way-finding signage
8. Create a policy
9. Promote your stations
10. Use your data

[LEARN MORE →](#)

## ADDENDUM

In the final days before publication of this guidance document, we learned of several valuable new guides that are worth highlighting.

In February, USDOT released *Charging Forward: A Toolkit for Planning and Funding Rural Electric Mobility Infrastructure*, a very good toolkit especially for rural communities. It can help connect community members, towns, businesses, planning agencies, and others with partners needed to build this EV charging infrastructure. It contains best practices for planning EV charging networks and tips to navigate federal funding and financing to help make these projects a reality. Find the link to download below along with two sections we'd like to highlight!

[LEARN MORE →](#)

*EV Infrastructure Planning for Rural Areas*

[READ MORE →](#)

*Resources for EV Infrastructure Planning*

[READ MORE →](#)



State and local officials should also address the “soft costs” that can slow the development of EV chargers. In order to meet NC and the Biden Administration’s transportation electrification goals, these stakeholders will need to break down the current barriers to faster charger development. The current process of bringing a fast charger online takes an average of 18 months, but with proper planning and alignment can be streamlined to just six months. [EVgo’s Connect the Watts](#) initiative recently released a series of best practice guides for public funding, utilities and local permitting to provide solutions to some of these challenges.

Process improvements may also include streamlined utility processes to ensure timely energization of third-party EV installs, as well as statewide permitting ordinances and/or guidance. New Jersey recently passed legislation that created a statewide ordinance for EV charging, which will help expedite charging deployments. For more information, click the link below.

[LEARN MORE →](#)



# NC CLEAN ENERGY TECHNOLOGY CENTER

In October 2021, a noteworthy *Public Fleet Electrification Guide* was published by Sourcewell, the cooperative purchasing and leasing organization. This twelve page guide is short, crisp, and easy to read with an overview of the challenge and helpful Myths vs Facts format to guide newcomers to this subject. This is a very good starting point for the municipal officer or public fleet manager who is just beginning to learn about EVs.

The reader will

- Understand the current capabilities of EVs
- Navigate speed bumps to public fleet electrification
- Access data, tools, & resources to drive decisions

LEARN MORE →

Another powerful new resource is the *Regional EV Charging Infrastructure Location Identification Toolkit (ILIT)*. The ILIT toolkit includes three tools — the ILIT Model, Results Mapper, and Data Viewer — which together allow the user to assess locations using key metrics important for DCFC infrastructure, including proximity to existing EV charging infrastructure, commercial activity, and demographic data.

Click [here](#) to watch a helpful video primer on how to use the model, mapper, and viewer.

LEARN MORE →

## The City of Raleigh EVSE Playbook

City of Raleigh is in the final steps of publishing their own guide, written for an audience of municipal staff involved with EVSE deployment. The authors are intending that this guide may be modified for use by other municipalities by changing some particulars (i.e., staff names, phone numbers and email addresses). Stay tuned for the link when the guide has been published!