SOUTHEAST REGIONAL EV READINESS WORKBOOK

SECTION 3

U.S. DEPARTMENT OF ENERGY

Clean Cities
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1st Edition

Disclaimer

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Questions? Corrections? Suggestions?

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

The following table provides a list of documents included as references in the *Southeast Regional EV Readiness Workbook*. The documents are available for download on each of the Tri-State Clean Cities coalition websites, as follows:

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

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Electric Vehicle Adoption in the Southeast
Peak Loading Addendum

August 2012

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Purpose

This report is prepared as an addendum to *Electric Vehicle Adoption in the Southeast* (1). It provides peak power loading information due to EV charging, supplementing the annual energy loading that was provided in the original report.

Method

This addendum uses data from Reference (1) for overall annual EV charging loads, home EV counts, and commuting distance data for zip codes in each of the twelve Tri-State clusters. It relies on the other reference works as cited for arrival times at home, work, and public charging stations. It considers EVs coming on charge or remaining on charge between 2PM and 7PM, which were given as peak charging times by the Southern Company and would be typical for the Tri-State area.

Evaluation of the effect of electric vehicles on the grid falls into two categories. First is the direct effect of EV charging on the power grid's physical equipment. Second is the reasonable worst case expectation of the effects based on projected charging patterns. This study looks at both aspects with respect to home, work, and public charging scenarios.

An analysis was done to determine a reasonable worst case scenario in terms of which type of charging station, Level 1 or 2, is at each type of location. A "reasonable worst case" is considered here to be the worst case of all likely scenarios and non-extreme circumstances. An example of an unlikely scenario is that all EV owners install 6.6 kW EVSE at home. An example of an extreme circumstance is if a bus company buys all electric buses with accompanying direct DC EVSE.

Home Charging

Direct System Impact -

The first place we can expect to see the effect of EVSE is at the point of service, which is the distribution transformer. The impact to the grid is not primary voltage dependent at this point since Level 1 and Level 2 EVSE are single phase devices. The impact is dependent on the available capacity of the transformer at peak conditions. Based on analysis by Southern Company, most distribution transformers have a 20% available capacity at peak. This may vary from utility to utility but is a viable basis for this study.

Currently available EVSE have a power factor ranging from 85% to 95% so we will use 90% as an average for this analysis. Based on these assumptions we can predict the number of EVs that could be installed before a transformer upgrade would be required based on the size of the transformer in place.

		# of EVs w/o Upgrade		
Transformer (KVA)	20% Capacity (KVA)	1.4 KW Charger	3.3 KW Charger	6.6 KW Charger
15	3	2	1	0
25	5	3	1	0
37.5	7.5	5	2	1
50	10	6	3	1
75	15	10	4	2
100	20	13	5	3
167	33.4	21	9	5
250	50	32	14	7

Table 1 – Distribution Transformer Charging Capacity

Reasonable Worst Case -

For **home** charging, the reasonable worst case was considered to be a **3.3 kW Level 2** EVSE, where the shopper or commuter returns home and immediately plugs in at a higher load than would result from a Level 1 EVSE. A 6.6 kW Level 2 EVSE would be absolute worst case, but it is projected that home 6.6 kW installations will be infrequent due to their typical need for additional service (i.e. more amps), and therefore added cost, weighed against their marginal added benefit over a 3.3 kW EVSE. Such infrequency of 6.6 kW EVSE at home would be more than offset by homes with only Level 1 EVSE.

Public and Workplace Charging

Direct System Impact -

Public and **workplace** charging begin to impact the grid at a higher level. At this point in the analysis we need to evaluate the impact to the grid at the distribution circuit level and substation level. At this level the impact then becomes primary voltage dependent.

First we can convert the kW demand of the EVSE to primary voltage amps, using the same 90% PF. We will use the most common primary circuit voltages.

Circuit Voltage (V)	1.4 KW Charger (AMPS)	3.3 KW Charger (AMPS)	6.6 KW Charger (AMPS)
4160/2400	0.648	1.528	3.056
12470/7200	0.216	0.509	1.019
13800/7970	0.195	0.460	0.920
20780/12000	0.130	0.306	0.611
24942/14400	0.108	0.255	0.509
34500/19920	0.078	0.184	0.368

Table 2 – Distribution Primary Charger Amps

Next we can determine the number of EVs that can be charged without any circuit upgrades. To evaluate the effect of EVs on the distribution circuits we need to know the average loading on a typical circuit. The current carrying capacity of a circuit is based on its limiting factor. The limiting factor is determined by the smallest ampacity rating of the substation breaker, phase over-current relay, feeder exit conductor, regulators or associated disconnect switches.

Most utility system planners start evaluating circuits for upgrade when they reach 75% of the limiting factor for the circuit. Southern Company analysis shows that most circuits, with a few exceptions, are well below the 75% limit factor loading. Based on this, we will use a conservative amount of 20% available capacity on an average distribution circuit to determine the number of EVs that can be charged without a system upgrade.

Circuit Voltage (V)	Available AMPS	# EV @ 1.4 KW	# EV @ 3.3 KW	# EV @ 6.6KW
4160/2400	100	154	65	33
12470/7200	100	463	196	98
13800/7970	100	512	217	109
20780/12000	100	771	327	164
24942/14400	100	926	393	196
34500/19920	100	1281	543	272

Table 3 – EV Charging Availability for Distribution Voltages

As shown in the table above, the higher the voltage of the distribution circuit the less the impact to the circuit from EV charging. In the Tri-State area the circuits are typically above 12470/7200 Volts. The utilities that still have 4160/2400 Volt systems will see the impacts of EVs much sooner.

Reasonable Worst Case -

For **public** charging, the reasonable worst case used here is a 3.3 kW **Level 2** EVSE. In comparison to 3.3 kW Level 2 charging, for Level 1 charging there could be three times as many EVs on charge at one-third the rate, but practically some EV drivers will need to leave a Level 1 EVSE before fully recharging which is less likely for Level 2 EVSE, making Level 2 the predominant public charger, and, therefore, the worst case. Using a sample zip code, a comparison was made of 3.3 kW charging versus 6.6 kW, assuming arrivals of EVs in each one hour window were evenly distributed. Peak loading alternated between the 3.3 kW EVSE and the 6.6 kW EVSE. In overview, what happens is that, because both will allow the EVs to be fully recharged, while the load due to any one 6.6 kW EVSE is double that of 3.3 kW EVSE, their users get recharged in half the time, so only half as many are in use at any one time. So, their demand is similar, but 3.3kW are likely to be predominant, so **3.3 kW** EVSE were used for analysis.

For **work** charging, only commuters arriving late (compared to the typical morning start times), and those with very long commute distances, both a small minority, would remain on, or come on, charge after 2PM if using Level 2 EVSE. Compared to the number of commuters who would remain on charge after 2PM using Level 2 EVSE, nearly 10 times as many commuters would remain on charge, or come on charge, after 2PM if using Level 1 EVSE, due to its slower charge rate. Using a charge rate of 1.4 kW for Level 1 and 3.3 kW for Level 2, clearly the 10X multiplier for number of Level 1 over Level 2 commuters outweighs the 3X multiplier for higher charge rate of Level 2 EVSE. So, **Level 1** EVSE represents the worst case for work charging.

In general, then, the EV charge loading for:

- each location of charging (home, work, or public),
- each zip code, and
- each one hour period during peak

was the product of

- the total number of EVs charging at that location (home, work, or public) in that zip code,
- times the statistically-determined proportion of the total EVs charging during each hour of the peak period,

- times the charge rate of that Level EVSE.

So, for example, to determine the work charging in zip code 30030 between 4PM and 5PM, it was estimated that 248 EV owners would be commuting to zip code 30030 for work each day (for 100,000 EVs in the Tri-State), of which 8.2% would be connected to a Level 1 EVSE between 4PM and 5PM.

Peak Charging Times and EV Quantities

The peak time for EV charging load for each zip code was simply the time during which the total of home, work, and public charging for that zip code was the greatest. Maximum loading occurred between 4PM and 5PM in 87% of the zip codes, 11% of the zip codes had their maximum loading occur between 2PM and 3PM, and 2% had their peaks occur between 3PM and 4PM. None of the zip codes had EV charging peaks occur between 5PM and 7PM. The zip codes whose peaks occurred between 2PM and 4PM were predominantly made up of commercial areas.

If the EVs were evenly distributed in each zip code between home, work, and public EVSE, then the 4PM to 5PM charging load would be:

- **72% at home**, due to shoppers, errand runners, and commuters returning home, with 4PM-5PM being the peak for this group.
- **21% at public** stations, due to shoppers or people doing errands, with nearly the same number of shoppers and errand-runners arriving between 4PM and 5PM as at the earlier peak shopping times.
- **7% at work**, due to commuters remaining on charge or coming on charge at work.

Table 4 shows the zip codes from the twelve Tri-State Clusters with the highest expected peak loading. In Table 4, "% rent" is the percentage of people who rent their residence in that zip code.

				EVs on charge @ peak for 100,000 TriState EVs			
City	Zip	kw	% rent	Home	Work	Public	Total
Roswell	30075	982	20	163	14	145	322
Atlanta	30308	863	59	44	113	175	332
Decatur	30030	848	43	239	20	34	293
Atlanta	30307	797	37	208	18	47	273
Atlanta	30309	764	52	147	86	64	297
Atlanta	30306	698	46	199	10	29	238
Sandy Springs	30328	668	42	130	75	53	258
Marietta	30062	659	15	180	24	28	232
College Park	30337	655	65	95	29	101	225
Duluth	30097	634	42	103	11	95	209

Table 4 - Zip Codes with Highest Expected Peak Charging

The percentage of people renting was included to make a point. Compare Roswell to College Park with 20% and 65% renters, respectively. With typically 72% of all charging occurring at home during peak, it is safe to say that if renters are not provided EVSE, then it will impact College Park's peak EVSE loading much more significantly than Roswell's.

Utilizing Southern Company data for available circuits in these zip codes (excluding City Municipality and Electric Membership Cooperative (EMC) circuits), we can compare the available distribution circuit charging capacity at peak to the projected number of EVs that would be charging during peak.

The majority of circuits in these zip codes are 20780/12000 V (20KV) so we will use this as the basis for the available distribution circuit capacity at peak. We also allocated the available capacity based on the same charging projections of **72% home charging, 21% public charging, and 7% workplace charging,** along with their corresponding projected reasonable worst case charging levels.

				EVs that could charge @ peak			
City	Zip	Circuits	Available Capacity	Home (72%) 3.3 KW	Work (7%) 1.4 KW	Public (21%) 3.3 KW	Total
Roswell	30075	9	900	2118	485	618	3220
Atlanta	30308	6	600	1412	323	412	2147
Decatur	30030	12	1200	2828	646	824	4293
Atlanta	30307	12	1200	2824	646	824	4293
Atlanta	30309	14	1400	3294	754	961	5009
Atlanta	30306	15	1500	3529	808	1029	5367
Sandy Springs	30328	17	1700	4000	915	1167	6082
Marietta	30062	4	400	941	215	275	1431
College Park	30337	6	600	1412	323	412	2147
Duluth	30097	7	700	1647	377	480	2504

Table 5 – EV Charging Capacity for Zip Codes with the Highest Projected EV Charging

Comparing the projected EVs on charge during peak for these zip codes in Table 4 with the available capacity at peak in Table 5, it is safe to assume that it would take a ten-fold market penetration, i.e. one million Tri-State EVs, to exceed the available capacity at peak assuming no upgrades were performed due to normal utility planning processes.

Peak Loading Data

The following peak loading data are for a reasonable worst case charging scenario of Level 1 EVSE at work and 3.3 kW Level 2 EVSE elsewhere, given 100,000 EVs in the Tri-State. These numbers can be directly multiplied to obtain peak loading for any other number of EVs.

Greenville-Spartanburg

Zip code	Peak (kW)	Occurs
29301	263.2	Between 4 PM and 5PM
29303	108.5	Between 2PM and 3PM
29306	112.1	Between 4 PM and 5PM
29316	97.4	Between 4 PM and 5PM
29365	56.0	Between 4 PM and 5PM
29369	96.0	Between 4 PM and 5PM
29377	2.5	Between 3PM and 4PM

29601	273.5	Between 4 PM and 5PM
29605	295.0	Between 4 PM and 5PM
29607	578.2	Between 4 PM and 5PM
29609	333.9	Between 4 PM and 5PM
29611	84.7	Between 4 PM and 5PM
29615	496.9	Between 4 PM and 5PM
29617	128.8	Between 4 PM and 5PM
29642	149.8	Between 4 PM and 5PM
29650	362.6	Between 4 PM and 5PM
29651	323.1	Between 4 PM and 5PM
29662	84.8	Between 4 PM and 5PM
29680	154.1	Between 4 PM and 5PM
29681	432.6	Between 4 PM and 5PM
29687	357.1	Between 4 PM and 5PM

Columbia

Zip code	Peak (kW)	Occurs
29033	60.5	Between 4 PM and 5PM
29063	250.9	Between 4 PM and 5PM
29072	402.4	Between 4 PM and 5PM
29073	119.2	Between 4 PM and 5PM
29169	217.0	Between 4 PM and 5PM
29170	109.9	Between 4 PM and 5PM
29201	546.0	Between 2PM and 3PM
29203	118.8	Between 4 PM and 5PM
29204	184.0	Between 4 PM and 5PM
29205	418.9	Between 4 PM and 5PM
29206	243.8	Between 4 PM and 5PM
29209	272.7	Between 4 PM and 5PM
29210	402.0	Between 4 PM and 5PM
29212	426.1	Between 4 PM and 5PM
29223	342.4	Between 4 PM and 5PM
29229	250.3	Between 4 PM and 5PM

Charleston

Zip code	Peak (kW)	Occurs
29401	295.9	Between 4 PM and 5PM
29403	229.0	Between 4 PM and 5PM
29405	131.7	Between 2PM and 3PM
29406	261.4	Between 3 PM and 4PM
29407	348.2	Between 4 PM and 5PM
29412	387.2	Between 4 PM and 5PM

29414	283.8	Between 4 PM and 5PM
29418	157.6	Between 4 PM and 5PM
29420	53.1	Between 4 PM and 5PM
29439	40.4	Between 4 PM and 5PM
29445	237.9	Between 4 PM and 5PM
29451	89.7	Between 4 PM and 5PM
29456	83.7	Between 4 PM and 5PM
29464	622.3	Between 4 PM and 5PM
29466	307.2	Between 4 PM and 5PM
29482	58.1	Between 4 PM and 5PM
29485	240.7	Between 4 PM and 5PM

Athens

Zip code	Peak (kW)	Occurs
30601	197.5	Between 4 PM and 5PM
30605	474.7	Between 4 PM and 5PM
30606	599.2	Between 4 PM and 5PM
30607	119.1	Between 4 PM and 5PM
30622	141.4	Between 4 PM and 5PM

Atlanta

Zip code	Peak (kW)	Occurs
30002	134.4	Between 4 PM and 5PM
30004	630.1	Between 4 PM and 5PM
30005	358.1	Between 4 PM and 5PM
30008	58.9	Between 4 PM and 5PM
30011	27.1	Between 4 PM and 5PM
30012	82.5	Between 4 PM and 5PM
30013	84.0	Between 4 PM and 5PM
30016	104.0	Between 4 PM and 5PM
30017	135.2	Between 4 PM and 5PM
30019	273.3	Between 4 PM and 5PM
30021	64.7	Between 4 PM and 5PM
30022	580.4	Between 4 PM and 5PM
30024	523.6	Between 4 PM and 5PM
30030	848.1	Between 4 PM and 5PM
30032	120.2	Between 4 PM and 5PM
30033	630.1	Between 4 PM and 5PM
30034	65.9	Between 4 PM and 5PM
30035	33.0	Between 2PM and 3PM
30038	109.3	Between 4 PM and 5PM
30039	152.8	Between 4 PM and 5PM

30040	347.0	Between 4 PM and 5PM
30041	427.6	Between 4 PM and 5PM
30043	450.7	Between 4 PM and 5PM
30044	345.9	Between 4 PM and 5PM
30045	149.3	Between 4 PM and 5PM
30047	433.0	Between 4 PM and 5PM
30052	199.3	Between 4 PM and 5PM
30058	61.7	Between 4 PM and 5PM
30060	260.7	Between 2PM and 3PM
30062	659.2	Between 4 PM and 5PM
30064	416.4	Between 4 PM and 5PM
30066	429.8	Between 4 PM and 5PM
30067	369.7	Between 4 PM and 5PM
30068	503.0	Between 4 PM and 5PM
30071	427.7	Between 2PM and 3PM
30072	25.5	Between 4 PM and 5PM
30075	981.7	Between 4 PM and 5PM
30076	535.8	Between 4 PM and 5PM
30078	222.1	Between 4 PM and 5PM
30079	27.1	Between 4 PM and 5PM
30080	423.0	Between 4 PM and 5PM
30082	196.6	Between 4 PM and 5PM
30083	231.2	Between 4 PM and 5PM
30084	337.8	Between 4 PM and 5PM
30087	270.0	Between 4 PM and 5PM
30088	52.4	Between 4 PM and 5PM
30092	322.3	Between 4 PM and 5PM
30093	178.0	Between 4 PM and 5PM
30094	133.9	Between 4 PM and 5PM
30096	457.7	Between 4 PM and 5PM
30097	633.9	Between 4 PM and 5PM
30101	263.9	Between 4 PM and 5PM
30102	201.2	Between 4 PM and 5PM
30106	68.8	Between 4 PM and 5PM
30115	310.7	Between 4 PM and 5PM
30122	38.4	Between 4 PM and 5PM
30126	146.2	Between 4 PM and 5PM
30127	223.2	Between 4 PM and 5PM
30134	67.3	Between 4 PM and 5PM
30135	212.0	Between 4 PM and 5PM
30141	54.5	Between 4 PM and 5PM
30144	392.7	Between 4 PM and 5PM
30152	243.6	Between 4 PM and 5PM

30157	112.7	Between 4 PM and 5PM
30168	89.7	Between 4 PM and 5PM
30188	362.4	Between 4 PM and 5PM
30189	425.1	Between 4 PM and 5PM
30214	204.6	Between 4 PM and 5PM
30215	232.5	Between 4 PM and 5PM
30228	69.6	Between 4 PM and 5PM
30236	138.1	Between 4 PM and 5PM
30238	33.7	Between 4 PM and 5PM
30250		
30253	169.5	Between 4 PM and 5PM
30260	77.3	Between 4 PM and 5PM
30265	206.1	Between 4 PM and 5PM
30269	410.4	Between 4 PM and 5PM
30273	12.6	Between 4 PM and 5PM
30274	22.3	Between 4 PM and 5PM
30281	344.9	Between 4 PM and 5PM
30290	91.7	Between 4 PM and 5PM
30291	25.2	Between 4 PM and 5PM
30294	62.0	Between 3PM and 4PM
30296	22.1	Between 4 PM and 5PM
30297	38.8	Between 2PM and 3PM
30303	614.4	Between 2PM and 3PM
30305	566.0	Between 4 PM and 5PM
30306	698.5	Between 4 PM and 5PM
30307	797.5	Between 4 PM and 5PM
30308	862.5	Between 2PM and 3PM
30309	764.5	Between 4 PM and 5PM
30310	117.7	Between 3PM and 4PM
30311	66.2	Between 4 PM and 5PM
30312	448.0	Between 3PM and 4PM
30313	196.2	Between 2PM and 3PM
30314	9.9	Between 4 PM and 5PM
30315	120.2	Between 4 PM and 5PM
30316	363.3	Between 4 PM and 5PM
30317	180.7	Between 4 PM and 5PM
30318	364.9	Between 4 PM and 5PM
30319	589.9	Between 4 PM and 5PM
30322	22.4	Between 3PM and 4PM
30324	418.7	Between 4 PM and 5PM
30326	77.8	Between 4 PM and 5PM
30327	467.2	Between 4 PM and 5PM
30328	668.1	Between 4 PM and 5PM

30329	283.1	Between 4 PM and 5PM
30331	157.0	Between 2PM and 3PM
30337	654.6	Between 4 PM and 5PM
30338	519.7	Between 4 PM and 5PM
30339	327.5	Between 4 PM and 5PM
30340	587.8	Between 2PM and 3PM
30341	353.3	Between 4 PM and 5PM
30342	478.6	Between 4 PM and 5PM
30344	91.9	Between 4 PM and 5PM
30345	399.3	Between 4 PM and 5PM
30346	87.5	Between 4 PM and 5PM
30349	127.4	Between 4 PM and 5PM
30350	319.8	Between 4 PM and 5PM
30354	108.3	Between 2PM and 3PM
30360	127.9	Between 4 PM and 5PM
30501	141.0	Between 4 PM and 5PM
30504	81.5	Between 4 PM and 5PM
30518	246.7	Between 4 PM and 5PM
30519	187.5	Between 4 PM and 5PM
30542	169.1	Between 4 PM and 5PM
30548	116.3	Between 4 PM and 5PM
30566	40.7	Between 4 PM and 5PM
30620	40.0	Between 4 PM and 5PM

Augusta

Zip code	Peak (kW)	Occurs
29828	5.1	Between 4 PM and 5PM
29834		Low loading expected
29841	214.3	Between 4 PM and 5PM
30809	294.0	Between 4 PM and 5PM
30813	93.8	Between 4 PM and 5PM
30901	306.1	Between 2PM and 3PM
30904	127.4	Between 4 PM and 5PM
30905	7.6	Between 4 PM and 5PM
30906	178.6	Between 2PM and 3PM
30907	319.4	Between 4 PM and 5PM
30909	183.6	Between 4 PM and 5PM

Macon

Zip code	Peak (kW)	Occurs
31005	97.4	Between 4 PM and 5PM
31028	37.8	Between 4 PM and 5PM

31088	282.1	Between 4 PM and 5PM
31093	116.6	Between 4 PM and 5PM
31201	151.4	Between 2PM and 3PM
31204	108.0	Between 4 PM and 5PM
31206	108.5	Between 3PM and 4PM
31210	232.3	Between 4 PM and 5PM

Savannah

Zip code	Peak (kW)	Occurs
31322	120.4	Between 4 PM and 5PM
31328	59.6	Between 4 PM and 5PM
31401	230.0	Between 4 PM and 5PM
31404	107.5	Between 4 PM and 5PM
31405	213.1	Between 4 PM and 5PM
31406	204.3	Between 4 PM and 5PM
31410	177.7	Between 4 PM and 5PM
31411	172.7	Between 4 PM and 5PM
31415		Low loading expected
31419	192.5	Between 4 PM and 5PM

Birmingham

Zip code	Peak (kW)	Occurs
35007	138.3	Between 4 PM and 5PM
35020	55.1	Between 2 PM and 3PM
35068	16.7	Between 4 PM and 5PM
35114	40.4	Between 4 PM and 5PM
35124	171.8	Between 4 PM and 5PM
35127	17.7	Between 4 PM and 5PM
35203	155.3	Between 2PM and 3PM
35204	22.2	Between 2PM and 3PM
35205	208.1	Between 4 PM and 5PM
35206	23.7	Between 4 PM and 5PM
35208	12.8	Between 4 PM and 5PM
35209	227.7	Between 4 PM and 5PM
35210	153.8	Between 4 PM and 5PM
35211	31.8	Between 2PM and 3PM
35212	34.0	Between 4 PM and 5PM
35213	198.6	Between 4 PM and 5PM
35214	15.2	Between 4 PM and 5PM
35215	67.7	Between 4 PM and 5PM
35216	364.6	Between 4 PM and 5PM
35217	34.9	Between 4 PM and 5PM

35218	11.7	Between 4 PM and 5PM
35221		Low loading expected
35222	133.6	Between 4 PM and 5PM
35223	223.6	Between 4 PM and 5PM
35226	333.1	Between 4 PM and 5PM
35228		Low loading expected
35233	94.4	Between 2PM and 3PM
35234		Low loading expected
35235	77.9	Between 4 PM and 5PM
35242	437.3	Between 4 PM and 5PM
35243	243.0	Between 4 PM and 5PM
35244	343.5	Between 4 PM and 5PM

Huntsville

Zip code	Peak (kW)	Occurs
35741	67.1	Between 4 PM and 5PM
35749	140.4	Between 4 PM and 5PM
35757	89.8	Between 4 PM and 5PM
35758	505.8	Between 4 PM and 5PM
35763	160.6	Between 4 PM and 5PM
35801	527.4	Between 4 PM and 5PM
35802	195.8	Between 4 PM and 5PM
35803	284.4	Between 4 PM and 5PM
35805	190.2	Between 2PM and 3PM
35806	272.4	Between 4 PM and 5PM
35810	68.9	Between 4 PM and 5PM
35811	210.7	Between 4 PM and 5PM
35816	60.4	Between 2PM and 3PM
35824	95.0	Between 4 PM and 5PM

Mobile

Zip code	Peak (kW)	Occurs
36511	15.2	Between 4 PM and 5PM
36526	324.5	Between 4 PM and 5PM
36527	172.7	Between 4 PM and 5PM
36532	304.1	Between 4 PM and 5PM
36559	13.9	Between 4 PM and 5PM
36561	104.7	Between 4 PM and 5PM
36564	7.6	Between 4 PM and 5PM
36602	88.7	Between 2PM and 3PM
36603	94.4	Between 2PM and 3PM
36604	131.3	Between 4 PM and 5PM

36605	73.7	Between 4 PM and 5PM
36606	192.5	Between 3 PM and 4PM
36607	50.8	Between 2PM and 3PM
36608	238.1	Between 4 PM and 5PM
36609	110.2	Between 4 PM and 5PM
36610	30.4	Between 2PM and 3PM
36611	6.6	Between 4 PM and 5PM
36612		Low loading expected
36617		Low loading expected
36618	43.8	Between 4 PM and 5PM
36619	90.2	Between 4 PM and 5PM
36693	117.3	Between 4 PM and 5PM
36695	420.0	Between 4 PM and 5PM

Montgomery

Zip code	Peak (kW)	Occurs
36054	34.3	Between 4 PM and 5PM
36066	59.0	Between 4 PM and 5PM
36104	125.8	Between 2PM and 3PM
36106	123.0	Between 4 PM and 5PM
36107	23.7	Between 4 PM and 5PM
36109	118.0	Between 4 PM and 5PM
36111	58.9	Between 4 PM and 5PM
36113		Low loading expected
36116	91.5	Between 4 PM and 5PM
36117	212.7	Between 4 PM and 5PM

Table 6 - Peak Loading Estimates

Reducing Peak Loading

Time-of-Use Billing

The previous peak loading estimates were for a reasonable worst case given 100,000 EVs in the Tri-State. The best case is that almost none of the EV charging occurs on-peak. Here's how that can happen:

Concerning the 72% of peak load due to home charging – The Idaho National Labs *Plug-in Electric Vehicle Demonstration* report (2) indicated that the EVs in their demonstration program were plugged into their home Level 2 EVSE an average of 11.5 hours per day, but reached full charge in an average of only 2.2 hours. With Level 2 EVSE, there is obviously a great deal of latitude to shift charging to start after 7PM and still reliably complete a recharge overnight. Even for a worst case of only Level 1 EVSE at home, no public or work charging stations, and a 7PM to 5AM charging window, that 10 hour charge provides a daily (electric) range of roughly 40 miles, which fills the needs of 82% of drivers per Pike Research's 2009 report, *Electric Vehicle Consumer Survey*. (3)

Concerning the 21% of peak load due to public charging stations – Unlike home and work charging, where the goal is to shift ***when*** EVs charge, the way to reduce on-peak charging at public stations is to shift ***where*** EVs charge, i.e. to get EV owners to delay charging until they reach their home or work charging station, reserving on-peak public charging to premium or emergency-charging-only through Time of Use (TOU) rates. In the Brattle Group's paper (4) on the effect of TOU pricing on EV charging patterns, they suggest a "potent" multiple of 8 times the normal rate. Aggressive premium billing at public EVSE can drive most shoppers and errand-runners to less expensive home EVSE leaving the public EVSE to the small proportion of battery-only EVs who must charge at public EVSE to complete their trip.

Concerning the 7% of peak load due to workplace charging – Table 8 from Reference (1) (shown here as Table 7) shows the distribution of work trips as a function of miles driven.

Electric Miles Driven	% of Trips (Cumulative)	Level 1 Charge Time (hr)	Level 2 Charge Time (hr)
5	7	1.05	0.35
10	26	2.10	0.70
15	49	3.15	1.05
20	64	4.20	1.40
25	79	5.25	1.75
30	92	6.30	2.10
35	99	7.45	2.45

Table 7 – Workplace Charging Estimates for Birmingham AL

First consider commuters charging with **Level 2** EVSE at work. It is noted from the US Census Bureau's 2009 American Community Survey (5) that over 90% of commuters arrive at work before noon and, from Table 7, about 90% of those can be charged in less than two hours with Level 2 EVSE. So, over 80% of commuters would reach full charge before peak hours with Level 2 EVSE. For the less than 10% who arrive after noon, if they are restricted from charging during the 5-hour peak period and are at work 8 hours, they still have at least a 3 hour charge window, which would satisfy 99% of their needs even under the worst case assumption that all of these workers arrive before 2pm, which is not likely since many are probably second shift workers. So, if work EVSE were all Level 2, then over 99% of the EV commuters could get fully recharged outside of peak hours, and the remaining few could get at least 40 miles worth of recharge outside of peak.

Now consider commuters charging with **Level 1** EVSE at work. From the analysis used for this addendum, only about 16% of those Level-1-using EVs contributing to the peak could be fully charged in the 3 hour charge window that would occur for 8-hour-a-day commuters starting work before 2PM and leaving after 7PM. (Note: Table 3 indicates that 49% of commuters could get charged in 3.15 hours. However, the contributors to peak load are mostly longer distance commuters, hence the analysis shows that only about 16% of the commuters ***who contribute to peak load*** could get fully recharged in 3 hours). So, time-of-use billing would be relatively ineffective for driving Level 1-using EV commuters off-peak.

EVSE Selection

The previous comments projected the potential for time-of-use billing to shift load away from peak at home, public, and work locations. The following will address the potential for reduced peak loading by selection of EVSE.

For the 72% due to home charging – For the most part, the same number of EVs will come on charge during peak whether the EVSE is Level 1 or Level 2, but the charge rate will be reduced by about 58%, if

all home EVSE were Level 1 rather than 3.3 kW Level 2. This would represent a reduction of about 42% (58% of 72%) in total peak loading.

For the 21% due to public stations – Assume that EV drivers' arrivals are evenly distributed, and that the drivers stay on charge until fully charged. Then, more or less, each Level 1 EVSE would only have 1/3 of the kW demand of the Level 2 EVSEs but the EVs would be on for 3 times longer, making the load even once it is stabilized. Changing from the theoretical to the practical, EV drivers are less apt to plug in when charge rate is lower and more likely to have to leave before getting fully charged. So, if the only concern was driving load off-peak, then Level 1 would be the best choice. But that is not the only concern, and the effect would likely be small and fairly unpredictable. For the purposes here, and because public EVSE can be expected to be almost entirely Level 2, it will be assumed that choice of level has no profound effect on peak load due to public charging.

For the 7% due to work – It was stated previously under "Method" that if Level 2 EVSE were provided at work, over 80% of commuters would naturally reach full charge before peak and over 99% of the remaining EV commuters could get fully recharged within a 3 hour charge window. So, with Level 2 EVSE at work and a restriction against 2PM to 7PM charging, all EV loading at peak due to workplace charging could be eliminated while still meeting all but a fraction of a percent of EV drivers' charging needs if there were all Level 2 EVSE at work.

Summary

If incentives for EVSE selection and time-of-use were totally effective in reducing peak loading due to EVSE, then the peak loading could be reduced by:

- Nearly 72% for home charging based on time-of-use incentive, regardless of EVSE type.
- Some portion of the 21% for public charging with use of potent premium billing during peak hours.
- Another 7% for work charging if Level 2 EVSE are provided.

Smart Grid

"Smart Grid" is the term used to define advanced management of grid components using new electronics, data and control management, and communications technologies. Part of the Smart Grid includes bidirectional energy flows which allow for distributed generation. One potential source of distributed generation is the use of electric vehicle batteries to supply energy to the grid, called Vehicle-to-Grid, or V2G. It is important to here distinguish V2G from two other uses of EV batteries. V2G as discussed here does not refer to:

(1) Recycling 'second-use' of EV batteries, after they are removed from the vehicle, for load balancing.

(2) Use of the vehicle's batteries with an inverter to support critical EV-owner's residential needs in the event of a power failure, in which case the EV's batteries and supplied inverter would be disconnected from the grid at the residence. This Vehicle-to-Home, or V2H, component has some selling points and is gaining more interest.

Keeping in mind that V2G is exclusive of those two EV battery uses, and, more importantly, reminding the reader that this Addendum is strictly concerned with the effect of EV charging on peak grid loads:

(1) The real-world practicality of V2G is uncertain at this time due to the limited market penetration of the vehicles in conjunction with the infancy of the technology available in the

chargers. Secondly, the receptiveness of the EV owner to the utilization of the batteries to support the grid is an unknown at this time.

(2) Should V2G become practical and EV penetration reach a point as to make it feasible, its obvious use would be to reduce peak loading. So, the effect of V2G on peak power demand could be beneficial.

The Smart Grid can also be used to alter the time of charging, rate of charging, or both. The benefits to peak demand of altering the time and rate of charging EVs were discussed in the section above entitled **Reducing Peak Loading with Time-of-Use Billing**. To achieve these potentially beneficial alterations will require involvement and approval of the EV owner and utility company, as well as a means to make it happen. The Smart Grid's data acquisition, controls, management, and communications technologies would be that means.

Conclusions

The intent of this report was to help determine if there would be a peak loading problem due to EV charging in the Tri-State and where it would likely occur. Based on the analysis of circuit data for zip codes in the Tri-State area, the capacity of the existing utility system grid infrastructure is adequate to accommodate the installation of 100,000 EVs. In fact, the existing utility grid infrastructure could comfortably accommodate 1,000,000 EV's in the Tri-State area with minimal impact other than at the point of service. Further, there are reasonable and effective means to drive EV charging off-peak to go well beyond 1,000,000 Tri-State EVs.

References

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5. **Brian MacKenzie, Melanie Rapino.** Commuting in the United States. 2011.

Electric Vehicle Adoption in the Southeast
EVSE Placement Addendum

August 2012

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Purpose

This document augments *Electric Vehicle Adoption in the Southeast* (1) by making specific recommendations regarding Electric Vehicle Supply Equipment (EVSE) placement, operation and funding.

Method

The EVSE will be addressed according to three different general placements:

(1) Residential.
(2) Work, specifically the EV driver's place of employment while the driver is at work.
(3) Public, referring to all EVSE other than residential or work.

The main goal is to optimize electric miles driven for a given investment with a secondary goal of shifting electrical load to off-peak for all its derivative benefits. **Explanations regarding these recommendations are provided following the Recommendations Summary.**

Recommendations Summary

(1) For each-

- major workplace
- rental property
- residence whose parking is controlled by a homeowners association

A funding and placement plan for EVSE should be developed well ahead of the actual need for EVSE. At a minimum, one dedicated 15 amp Ground Fault Circuit Interrupter (GFCI) protected circuit (for Level 1 EVSE) should be provided for every to-be-parked EV plus one additional dedicated 15 amp GFCI circuit. "Plus one" is to account for any delay in providing the circuit prior to EV arrival.

(2) For purely public EVSE, any parking lot or deck with over (85) parking spaces whose users are expected to be parked over 2 hours should have Level 2 EVSE available by 2015 at a density equal to 0.6% of parking spots. Public Level 2-equipped spaces should be metered with an hourly rate equal to one sixth the price of a gallon of gasoline plus the normal value of the parking spot, regardless of

whether that parker is recharging or not. Charging during peak hours should be at eight times the price of electricity plus the normal value of the parking spot.

(3) For both of the first two recommendations, EVSE funding and placement agreements should be secured in advance and publicized with a sign at the future EVSE location.

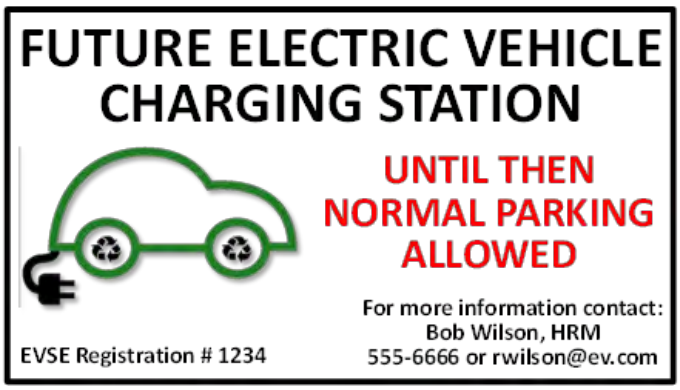

Figure 1 – Sample EVSE Sign

(4) In open lots with no compelling reasons for EVSE placement, the EVSE-equipped parking spots should be "1/3 out". That is, one third of the parking spots should be closer to the entrance of the building the lot serves and the other two-thirds should be farther away.

Recommendations Detail

Residential EVSE

In a simulation of EV driving done in the twelve urban areas studied for *Electric Vehicle Adoption in the Southeast* (1) it was determined that 57% of EV charging would be done at home, if every EV driver had access to level 2 EVSE at home, work, and in key public locations. In an EV simulation done for Greenville County, South Carolina (2), it was found that 60% of all miles driven could be converted to electrically driven miles if the EV driver only had access to a Level 1 EVSE at home. In that same simulation, converting those Level 1 EVSE to Level 2 EVSE at home provided little additional benefit. So, for purposes of converting miles driven from gasoline to electricity, installing a Level 2 EVSE at home may not be worth the investment over the Level 1 EVSE that comes with the vehicle. However, there are still reasons to install a Level 2 EVSE at home:

(1) Compared to using the EVSE supplied with the vehicle, it is more convenient.

(2) Some EV drivers' daily driving habits exceed their electric range and they require (for BEV) or desire (for PHEV) a quick charge when returning home and then going out again.

(3) Level 2 EVSE may be more effective at shifting load to off-peak.

The Idaho National Labs Plug-in Electric Vehicle Demonstration report (3) indicated that the EVs in their demonstration program reached full charge in an average of 2.2 hours. Even with a Level 1 EVSE, the equivalent charging time would be under seven hours. Obviously, for the great majority of EV drivers, these seven hours can start after the end of the 2PM to 7PM peak time, which is the time window Southern Company uses to define peak. Load shifting can be done without needing a Level 2 EVSE. However, the customer needs not only fiscal incentive to charge off-peak, but often convenience. The

demographics of the early EV buyers indicate that they are usually financially secure, but typically busy. So, convenience may be the predominant issue.

As part of the global research for the Greenville study (2) (see same for references), EV sales are almost directly proportional to the potential for home EVSE availability. For people living in condominiums or rentals, that is very often a challenge. Each needs a dedicated space for the EVSE and may not already have one. For condominiums, this will usually require approval of the homeowners association or their board, whose meetings are often infrequent and poorly attended. In 2010 the State of Hawaii passed Senate Bill 2231 which addressed the placement and approval of EVSE at homeowner association controlled residences by enacting a state-wide requirement to ensure such placements are accommodated. Documents that outline the testimony from this legislative hearing can found at the end of this report.

In any case, the approval process can be, and should be, started prior to any investment or even an EV owner's request. Then there is the issue of funding for rentals. Who pays for the EVSE when the owner might move in six months? There are at least four business models developed to answer that question.

1. **A third party pays** and may recover costs through usage billings, at-cost for the electricity and cost plus profit for the EVSE. The third party reimburses property owners for any electricity used. The third party could be for-profit, not-for profit, or grant-providing.

2. **The property owner pays** and recovers costs through rent premiums, acting much like the third party.

3. **The renter pays** for the EVSE and the property owner pays for the service to it. In this case, the renter owns and can remove the EVSE. The property owner would then recover costs as in option (2), minus the EVSE cost.

4. **A cost sharing group pays**. While this can obviously be any combination of options (1) through (3), here is a recommendation:

   - The EV-owning renter pays for the EVSE and takes it when moving.
   - The servicing utility pays for the service recovering their cost through time-of-use benefits, premium billing, or a combination of both.

Residential EVSE placement recommendation and suggestions

The major recommendation for residential charging, and the most significant recommendation from this document is that focus for residential charging be on rental properties and properties whose parking is controlled by a homeowners association. The two objectives of that focus are to enable placement of the EVSE well prior to actual need, and to establish an action plan for EVSE purchases and installation.

A suggestion for upgrading from Level 1 to Level 2 is that it be funded by the utilities with costs recovered through time-of use savings.

A suggestion for off-peak charging is that it occurs with no daily effort by the EV owner once the EV owner has provided approval to the electric service provider for off-peak charging.

Work EVSE

In the simulation of EV driving done in the twelve urban areas studied in *Electric Vehicle Adoption in the Southeast* (1) it was determined that 26% of EV charging would be done at work if every EV driver had access to level 2 EVSE at home, work, and in key public locations. Table 7 of that report indicates that, with a Level 1 EVSE, 99% of EV drivers could recharge from their commute in less than 8 hours. There

appears to be little cost incentive for an upgrade to Level 2 for the driver who stays at work for 8 hours per day, except possibly for having the charging occur off-peak:

In the *Peak Loading Addendum* (4) to *Electric Vehicle Adoption in the Southeast* it was stated that:

"…[by replacing Level 1 EVSE] with Level 2 EVSE at work and a restriction against 2PM to 7PM charging, all EV loading at peak due to workplace charging could be eliminated while still meeting all but a fraction of a percent of EV drivers' charging needs."

In summary, Level 1 EVSE at work will allow nearly all EV-driving commuters to fully recharge while at work, although some of that charging will need to occur during peak load hours. That peak-hour charging can be eliminated with Level 2 EVSE's due to its faster charge rate that allows late arrivers and long-distance commuters who work eight hours to get their EV's charged in any three hour window outside of the five hour 2PM-7PM peak.

Work EVSE placement recommendation & suggestions

The major recommendation for workplace EVSE is very similar to residential: Enable placement of the EVSE well prior to actual need, establish an action plan for Level 1 EVSE purchases and installation, and provide one Level 1 EVSE per EV-owning worker.

A suggestion regarding Level 2 EVSE at the workplace is that they be treated in every way like public EVSE.

Public EVSE, metered approach

In the simulation of EV driving done in the twelve urban areas studied for *Electric Vehicle Adoption in the Southeast* (1) it was determined that 17% of EV charging would be done at public EVSE if every EV driver had access to level 2 EVSE at home, work, and in key public locations. That does not mean that 17% of the miles driven would revert to being powered by petroleum if there were no public EVSE. Note the words "if every EV driver had access to level 2 EVSE at home, work, and in key public locations". The Greenville simulations (2) evaluated the additional benefit of adding public EVSE if every EV driver already had a Level 2 EVSE at home and work. The benefit in converting gas-powered miles to electric-miles by adding a full complement of public Level 2 EVSE was less than 3 percent. To be clear, what is being said is that while 17% of charging will occur at public EVSE if EVSE are 'everywhere', if you remove the public EVSE, of that 17%, 14% will revert to charging more at home or work and 3% will revert to gas miles. However, there are other reasons beyond direct, statistical gas-to-electric-miles conversions for justifying public EVSE:

(1) Many public EVSE may also be work or home EVSE. Continuing to use Greenville as an example, the Level 2 EVSE that were installed in their public garages are serving all three purposes.

(2) Very visible EVSE, as public EVSE can be, serve to reduce range anxiety and make the general public aware of the advent of EVs.

(3) For the battery-only EV driver, a public EVSE may be a requirement to get to the next destination, and the extended range EV driver may want to maximize electric miles.

Recommendation (3) at the beginning of this document stated "Public Level 2-equipped spaces should be metered with hourly rate equal to one sixth the price of a gallon of gasoline plus the normal value of the parking spot, regardless of whether that parker is recharging or not". So, if parking was $1 per hour for other spots in the same lot or deck, and gasoline was $3 per gallon, the 3.3 kW EVSE-equipped spot would be metered at $1.50 per hour. Here are the bases.

(1) For the provider of the EVSE, the cost could be partially recovered, as shown in Table 1, which uses the current national average utility cost of $.11 per kWh and a 3.3 kW EVSE.

Metered EVSE parking use	Electricity cost	Net cost recovery
Parked car is charging	$.11/kWhr X 3.3kW=$.36/hr	$.50/hr - $.36/hr=$.14/hr
Parked car is not charging	$0	$.50/hr-$0=$.50/hr

Table 1 – Cost Recovery for EVSE with Metered Parking Based on Time

Further, the EVSE would not require billing mechanisms, which will lower the cost of EVSE.

(2) For the driver of an extended range EV, it allows recharging at about one-half the rate of what the gasoline alternative would have been. Using as an example:

- $3 per gallon for gas
- a totally discharged Chevy Volt
- a 3.3 kW EVSE

A Chevy Volt will get about 40 miles from:

- One gallon of gas or
- A 3 hour charge time on a 3.3 kW EVSE

Table 2 shows costs of using the metered spot versus not using it.

Park time	Added cost of spot over non-EVSE spot	Cost of gasoline	Savings from EVSE equipped spot
3 hours	($1.50-$1.00)/hours X 3 hours=$1.50	$3	$3.00-$1.50=$1.50
6 hours	($1.50-$1.00)/hours X 6 hours=$3.00	$3	$3.00-$3.00=$0

Table 2 – Comparison of Cost of Gasoline vs. EVSE Equipped Spot for a Volt

So, looking only at the financial aspects of metered parking, the Volt owner will cut costs in half if the Volt is parked only while behind charged, and will begin paying a penalty over gasoline if parked for more than double the time to charge the Volt.

(3) For legislators and enforcing agencies, no new regulations are needed to control misuse of EVSE-equipped spots. They are simply premium priced metered spots.

Current plans propose fines for non-EVs parking in an EVSE equipped space. That may be a good addition to the recommendation, but it does not address fully charged EV using an EVSE spot for parking convenience, EV drivers using the spot well beyond the time required to recharge, and even the sure-to-come after-market faux charge cords. So, fines for non-EVs parking in an EVSE space may act as a deterrent to improper use, but should not be a replacement.

The previous does not address the potential need to shift charging at public EVSE to off-peak. PG&E (5) suggests premium pricing to discourage unnecessary EVSE use during peak hours. They propose a rate of eight times the normal cost of electricity. For a 3.3 kW EVSE at $.11 per kWh this comes to about $2.90 an hour *while charging* or a little bit less than triple the equivalent cost of gasoline for a Volt driver paying $3 per gallon. This essentially reserves the on-peak charging for those who really need it.

In summary, the metered approach is highly recommended for public EVSE with rates set according to goals.

Public EVSE, % parking spots with EVSE

Data from the three states in *Electric Vehicle Adoption in the Southeast* (1) indicate that, ***if*** –

- EV arrivals at public chargers in a zip code reflected the same proportion as that of EVs in that same zip code and
- 1% of the Southeast's vehicles were EVs, and
- any given parking lot was full, then

the percent of zip codes whose EV drivers would have access to a public EVSE would be as follows:

% of spots with EVSE	% of zip codes whose EV drivers would encounter open EVSE spots	Percentage point increase over 1.00% case
1.00%	67.3%	-
1.25%	74.7%	7.4%
1.50%	79.9%	12.6%
1.75%	82.7%	15.4%
2.00%	85.8%	18.5%

Table 3 – Benefit of Adding More EVSE at Public Charging Locations

So, doubling the number of EVSE from 1% to 2% will only add 18.5% more zip codes.

But, parking lots are not always full, arrivals are not always evenly distributed, and drivers arriving at public EVSE are rarely in need of a recharge. The need is difficult to predict so the tendency is to wait for experience with current installations, which is forthcoming, but possibly too late. Until those data are available, a recommended approach is to install EVSE at any location with over 50 parking spaces at the rate of 1% of the total parking spots, but only in locations whose users generally would be expected to park for at least two hours. The two hour trigger is based on two compounding factors: time available to charge and likelihood of plugging in based on that time.

For public EVSE, until experience yields a reliable business model, a cost-share approach is also recommended between the utility, and the owner of the parking lot, with the investment being recovered through premium billings.

By virtue of the type of use, there is little latitude in when to use a public EVSE, so little can be done to shift load off-peak. However, if 8X billing is used as a peak time rate then the use of the Level 2 EVSE will be minimized to those in need or with a strong desire to charge on-peak.

Public EVSE placement recommendation & suggestions

The recommendation concerning purely public EVSE is that any lot with over fifty parking spots whose users are expected to be parked over 2 hours should have Level 2 EVSE equal to the density of EVs in that urban area. Using the original goals set forth for the Southeast Regional EV Readiness Planning Program of 100,000 EVs in the three-state region by 2015, then, with an estimated 17 million registered vehicles, 0.6% of the parking spots should be Level 2 EVSE-equipped by 2015.

EVSE in General

The following recommendations apply to more than one type of EVSE use.

Parking spot locations

One of the decisions to be made is where, within a parking lot, to place the EVSE. Often there are compelling reasons, such as availability of electrical service, which will drive that decision. When there are no compelling reasons, the EVSE has very often gone right next to the parking for handicap drivers. This has the potential for creating detrimental backlash. Despite efforts to find such, the writers are not aware of guidelines for where EVSE spots should be, so one is proposed here: "1/3 out". That is, for the EVSE parking spot(s) whose location is not driven by any compelling factor, 33% of the other parking spots should be "closer to the door" and 67% should be farther.

Preapprovals and signs

Approvals for funding EVSE and for their placement can take many months, but there is no reason why such approvals can't occur prior to need and at no expense. Using workplace-EVSE as an example, the employer can plan the location, usually get a free estimate of installation cost, and decide on the degree of willingness to fund (e.g. willing to pay 1/3 of the EVSE cost) in preparation for the first EV-driving employee. Then that parking spot can be identified with a sign, containing contact information that accomplishes two objectives: (1) For the potential EV driver, it says that their employer would be willing to put in an EVSE under conditions (e.g. degree of co-funding) identified up-front and (2) for everyone else it says that if they have an objection to future reservation of that spot, they should voice it now. That idea is described in detail in the Greenville study (2).

Building codes & new construction

Between hardware and labor for EVSE installation, labor is often the greater cost, and will be more so as the cost of EVSE comes down. However, this labor cost can be significantly reduced if EVSE readiness is considered in new construction. , Reference the City of Vancouver's Green Homes Program as it relates to the provision of electric raceways.

Variables

There are several variables which should be monitored and comprehended over time in order to optimize EVSE decisions.

(1) EVSE cost
(2) EVSE actual usage data
(3) EV rollout

Links to Hawaii's EVSE Enabler Bill

The following hyperlinks pertain to Hawaii's Senate Bill 2231 which is a state-wide requirement to ensure EVSE placements are accommodated at homeowner association controlled residences.

www.capitol.hawaii.gov/session2010/testimony/SB2231_HD1_TESTIMONY_FIN_03-31-10_3_.pdf

www.capitol.hawaii.gov/session2010/testimony/SB2231_HD1_TESTIMONY_FIN_03-31-10_3_LATE_.pdf

www.capitol.hawaii.gov/session2010/testimony/SB2231_SD1_TESTIMONY_EEP_03-09-10_.pdf

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Electric Vehicle Adoption in the Southeast

March 2012

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1. Introduction

Electric Vehicles (EVs), both Plug-in Hybrid Electric Vehicles (PHEVs) and Battery Electric Vehicles (BEVs), offer a paradigm shift from the gasoline and diesel fueled cars that have dominated the US transportation sector for the past century. EVs offer several advantages, including:

- The ability to use electricity produced by domestic fuels (including coal, nuclear, natural gas, hydro, wind, and solar), thus increasing our energy security through decreased dependence on foreign sources of petroleum,
- Zero emissions at point of use and overall lower emissions when powered by electricity produced from reduced emission power plants, thus improving the air quality, particularly in high use urban areas,
- An existing fueling infrastructure (the existing electric generation and transmission grid has enough excess capacity, if charging is properly controlled, to replace almost 75% of the existing light duty vehicles with EVs without adding new generation or transmission (1)), and
- Reduced operating expenses resulting from the lower cost of electricity relative to petroleum.

However, EVs are a new technology, with which many drivers are unfamiliar, and like many new technologies, the first entries into the market are expensive and have more limited performance than their gasoline fueled counterparts. This raises several questions:

- How quickly will EVs penetrate the transportation market?
- How large is the EV market?
- What factors could have the greatest influence on the rate of EV adoption?
- What incentives can be used to increase the rate of EV adoption?
- Where is charging infrastructure needed?
- What demands will EVs place on the existing electric grid and where and when will they occur?

As part of the *Southeast Regional EV Readiness Planning Program* funded by the Department of Energy, the South Carolina Institute for Energy Studies (SCIES) performed a study to answer these questions. The study analyzed:

- Predicted demand for EVs
- Demographics of potential EV adopters
- Elasticity of demand resulting from changes in vehicle or fuel prices and government incentives
- EV Supply Equipment (EVSE) distribution requirements and grid load

This report documents the results of that study.

2. Predicted EV Demand

2.1.Previous Studies

Numerous studies have been performed to estimate the demand for EVs in the US and the world. The results of those studies, some of which are shown in Figure 1, (2) vary widely. Predicted US annual sales of EVs in 2020 vary by as much as a factor of 4, showing the large range of uncertainty in the future demand for EVs. Numerous factors combine to create these variations, including:

- EV prices
- EV performance, safety, and reliability

- The availability, magnitude, and type of government incentives
- The availability of EVSE at home, work, and other destinations
- The relative prices of gasoline and electricity
- Projected improvements in the fuel economy of petroleum fueled vehicles

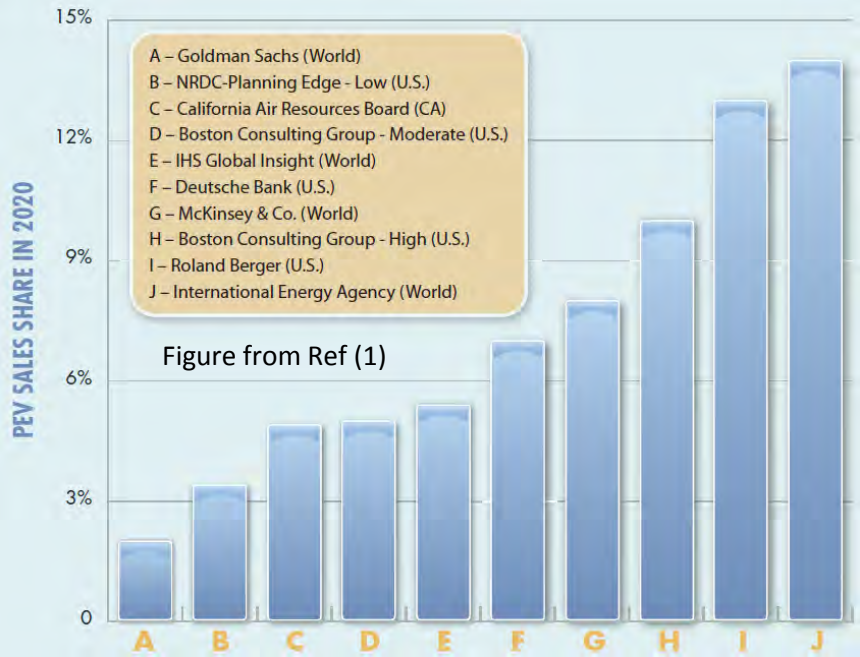

Figure 1 – EV Demand Study Results

A summary of some of the most relevant reports are provided below.

Gaining Traction – A Customer View of Electric Vehicle Mass Adoption in the U.S. Automotive Market. (3) In this 2010 study, Deloitte Consulting LLP developed three scenarios for forecasting EV demand in the US (aggressive, probable, and conservative). These scenarios differed in the average purchase price of the EVs, the vehicle range, and the price of gasoline. The three scenarios are summarized in Table 1, along with the predicted level of US market penetration in 2015 and 2020 under each set of conditions.

Variable	Aggressive Scenario	Probable Scenario	Conservative Scenario
EV Purchase Price	$25,000	$35,000	$45,000
EV Range	350 miles	200 miles	100 miles
Gas Price	$4.50/gallon	$3.50/gallon	$3.00/gallon
Annual Sales / Market Share			
2015	75,000 / 0.5%	60,000 / 0.4%	45,000 / 0.3%
2020	840,000 / 5.6%	465,000 / 3.1%	285,000 / 1.9%

* Data from Ref (2)

Table 1 – Estimated US EV Demand for Three Scenarios

Deployment Rollout Estimate of Electric Vehicles 2011-2015. (4) This study, by the Center for Automotive Research (CAR), used a combination of the IHS Global Insight forecast, the J.D. Power forecast, and CAR research to develop an estimate of annual sales for the 2011-2015 timeframe. Then they allocated these national figures to the individual states, based on the proportion of registered hybrid vehicles in that state to the national total of registered hybrid vehicles. Their national sales

forecast is shown in Figure 2. Individual annual sales estimates for Alabama, Georgia, and South Carolina are shown in Figure 3.

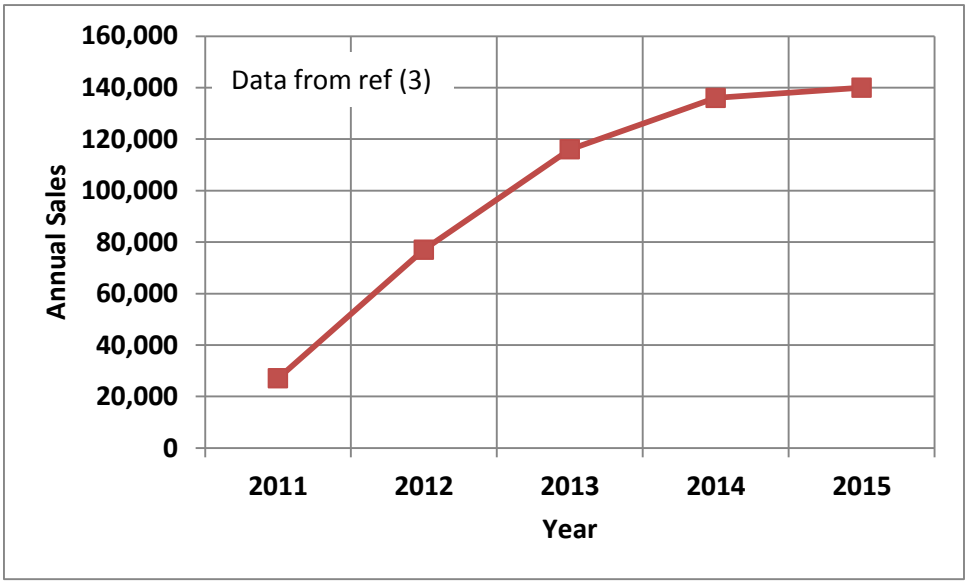

Figure 2 – Estimated US Annual EV Sales from CAR Study

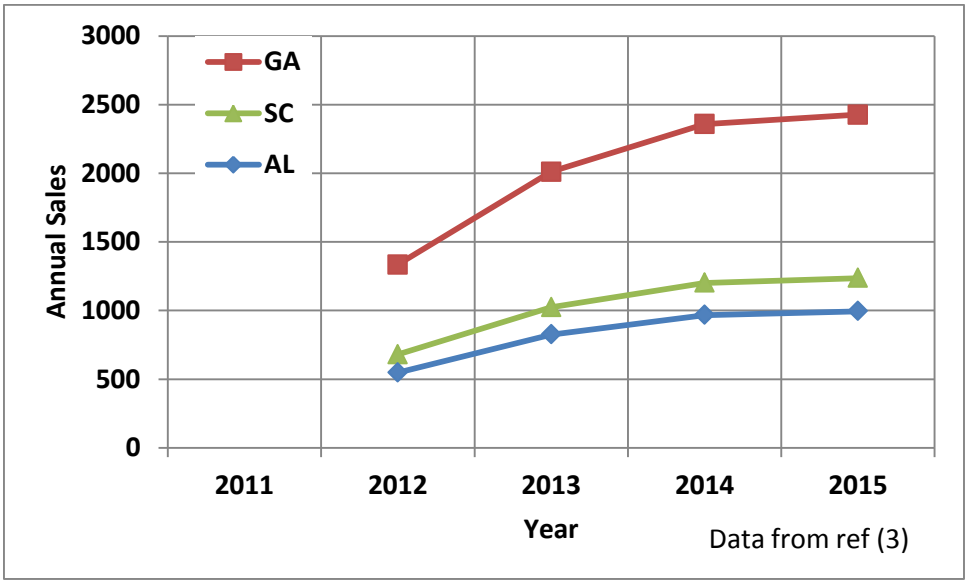

Figure 3 – Estimated Tri-State Annual EV Sales from CAR Study

Plug-In Electric Vehicles. (5) A September 2010 study by Pike Research estimates that between 2010 and 2015, EV sales will grow at a compound annual growth rate of 106%, with total global sales of 3.2 million EVs by 2015. Pike estimates that a total of approximately 840,000 EVs will be sold in the US in the 2010-2015 timeframe. US sales for 2015 are estimated to be 200,000 PHEVs and 60,000 BEVs. Their research indicates that PHEVs and BEVs will complement, rather than displace, conventional hybrids.

The Comeback of the Electric Car? How Real, How Soon, and What Must Happen Next. (6) The Boston Consulting Group looked at the impact of oil prices and climate concerns on EV sales. They modeled three scenarios in four worldwide markets. Under the first scenario, called "slowdown", where oil prices moderated to $60 per barrel and minimal concerns existed about global warming, they estimate a 1% EV

share of new car sales in North America by 2020. At the other extreme, under their "acceleration" scenario, with oil at $300 per barrel and government imposed regulation on greenhouse gases, they estimate that EVs would capture 10% of the market in 2020. For the intermediate "steady pace" scenario, with oil at $150 per barrel, they estimate that EVs in North America would reach 5% of sales (about 1,000,000 vehicles) by 2020.

The E-Mobility Era: Winning the Race for Electric Cars. (7) This Bain and Company study considered four key influences on the demand for alternative vehicles: oil prices, zero emission zone policies and regulations, climate change considerations and worldwide subsidies for the industry. Under the "little change" scenario with oil below $100 per barrel, few zero emission zones, no agreement on climate change, and only regional subsidies, they estimate that EVs will capture 7% of the global market in 2020. With oil at $200 per barrel, zero emission zones enforced in some large cities, and $10-30B in government subsidies, they predict that EVs will reach 25% of annual sales in 2020. Under their "fundamental change" scenario, with oil at $300 per barrel, zero emission zones in all large cities worldwide, climate change regulations in force, and $50-100B in government subsidies for EVs, they forecast that electric vehicles will constitute 50% of new car sales in 2020.

The Fast Lane to the Adoption of Electric Cars. (8) The most optimistic of the studies reviewed was that of McKinsey & Company. Their 2009 study found that large cities were the most likely locations for early adoption of EVs. They concluded that, even without increasing the incentives available today and with only limited EVSE in place, EVs could account for 16% of annual sales (70,000 vehicles) in New York City by 2015.

2.2.Tri-State Demand Analysis

2.2.1. Baseline Case

It is clear from these previous studies that there is a wide variation in the predicted level and rate of EV market penetration. The predictions reflect the large amount of uncertainty in oil prices, government regulation of greenhouse gas emissions, enforcement of zero emission zones in large cities, EV cost and performance, improvements in internal combustion engine vehicles and hybrids, availability of EVSE, electricity prices, consumer interest in the environment, and the size and type of government subsidies. Given this uncertainty, SCIES chose to take a different approach to estimating vehicle demand – the Bass diffusion model.

The Bass diffusion model (9) was developed by Frank Bass in the 1960's as a model of how products are adopted. It is one of the most widely used forecasting tools in use today. The model is built on the assumption that the rate of adoption is influenced by both external influences, such as mass market advertising, and internal influences, such as word of mouth from previous adopters. Bass defined sales as a function of three unknowns – "M" the total potential market, "p" the coefficient of innovation (external influence) and "q" the coefficient of imitation (internal influence).

The three variables, p, q, and M can be determined either by curve fitting existing data or from historical data of analogous products. For this study, both methods were used. Examples of analogous products include cell phones, microwaves, and hybrid corn. These seemingly different products have one element in common – they were all new technologies introduced into existing markets, e.g. existing wire based phones, conventional ovens, and seed corn. Electric vehicles are similar in that they are being introduced into an existing ICE vehicle market. Therefore, we would expect the p and q coefficients for our study to be similar to those determined from prior studies of these three products, as listed in Table 2. (10)

Product	p	q
Cell Phones	0.008	0.421
Microwaves	0.002	0.357
Hybrid Corn	0.000	0.797
Average	**0.003**	**0.525**

Table 2 – Bass Coefficients of Similar Products

A second method of determining the coefficients is to curve fit historical data for similar products, in this case, hybrid electric vehicles. Hybrids are a good proxy for EVs, in that they are sold in the same market, by the same manufacturers, use similar technology, and appeal to similar consumers. SCIES originally planned to use historical sales data for hybrids in Alabama, Georgia, and South Carolina to determine the Bass model coefficients. The plan was to develop separate coefficients for each of the cluster areas in each state, to allow for different rates of adoption in different geographic areas. However, SCIES was able to obtain only one year of sales data for Georgia and Alabama, making this approach impossible. Therefore, an alternate approach was used. Multi-year hybrid data for the three South Carolina clusters was obtained from the SC Department of Motor Vehicles and used to determine a single set of coefficients.

Figure 4 shows that the rates of hybrid adoption are different in the three cluster areas (Charleston, Columbia, and Greenville-Spartanburg) and the remainder of the state, with Charleston showing the highest rate of adoption and the areas outside the clusters (i.e. the rest of the state) showing the lowest rate of adoption.

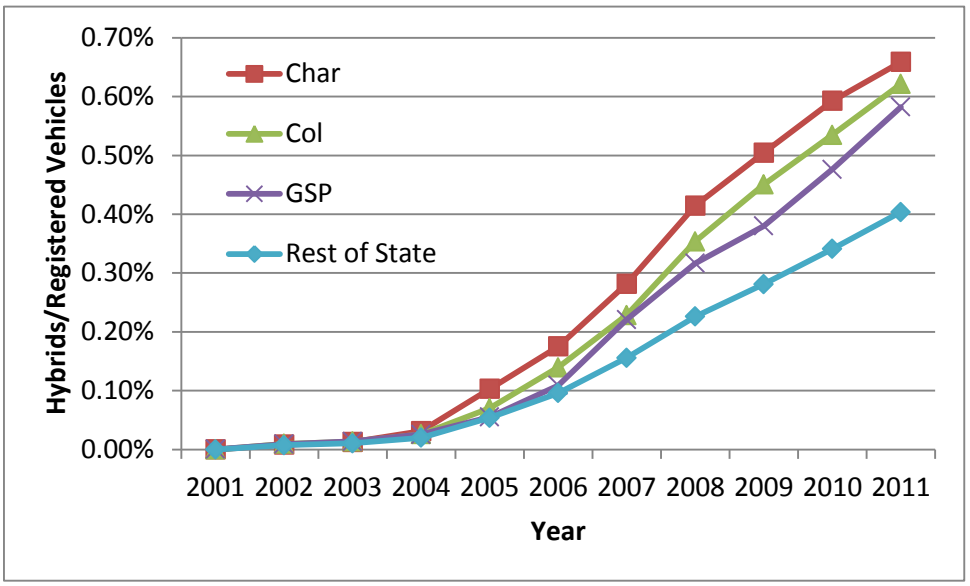

Figure 4 – Rate of Hybrid Adoption in South Carolina

An approach was needed that would estimate the trends of all the clusters, as well as the rest of the state with a single set of coefficients. The approach selected was to define a common set of innovation and imitation coefficients using the data from the three SC clusters and the rest of the state, and then to vary the market size, i.e. the third variable in the Bass model, to establish the final "fit" to the data. The estimated p and q coefficients were p = 0.002 and q = 0.500, which compared favorably with the coefficients for the similar products in Table 2 above. The corresponding market sizes were proportional to the actual number of hybrids registered in each area in 2011. Since 2011 hybrid registration data was available for Alabama and Georgia, this common approach could be used for the tri-state area. Figure 5

shows that the model compares favorably with the actual hybrid sales data through 2008. Beyond that point, the predictions exceed the actual sales. This is due to the collapse of the auto market and the broader financial issues associated with the "Great Recession". For this study the model predictions were used, thus assuming that the auto market will not experience a similar loss of momentum during the period from 2011 to 2020.

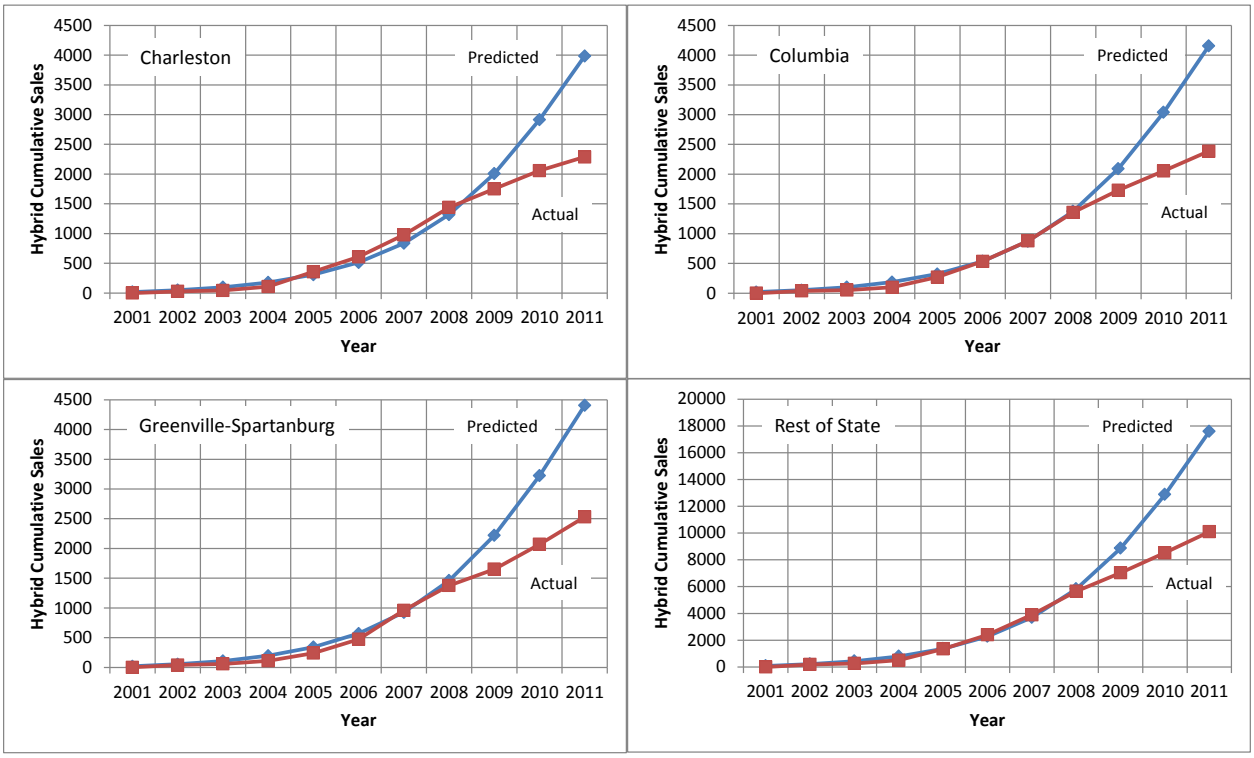

Figure 5 – Predicted EV Demand in South Carolina

Using this same approach for Alabama and Georgia, the market size estimates shown in Table 3 were calculated. Given the coefficients of innovation and imitation derived from the hybrid data, the model predicts that these market levels will be reached in about twenty years (2030). These market sizes are based on the assumption that EV demand will mirror historical hybrid demand, excluding the effects of the current recession. As actual market factors for EVs deviate from those that influenced hybrid sales, the sales forecast will need to be adjusted.

Georgia		Alabama		South Carolina	
Area	**EV Market Size**	**Area**	**EV Market Size**	**Area**	**EV Market Size**
Athens	4,478	Birmingham	10,989	Charleston	11,565
Atlanta	92,036	Huntsville	8,037	Columbia	12,061
Augusta	4,529	Mobile	7,036	G'ville-S'burg	12,788
Macon	2,962	Montgomery	2,386	Rest of SC	51,053
Savannah	4,751	Rest of AL	38,456	**Total**	**87,467**
Rest of GA	57,543	**Total**	**66,904**		
Total	**166,299**				

Table 3 – Estimated Tri-State EV Market Sizes

These market levels correspond to a national market size of about 10,000,000 EVs, with estimated annual sales, once the full market is reached, of about 1,000,000 vehicles. The cumulative sales estimates for each state are shown in Figures 6-8.

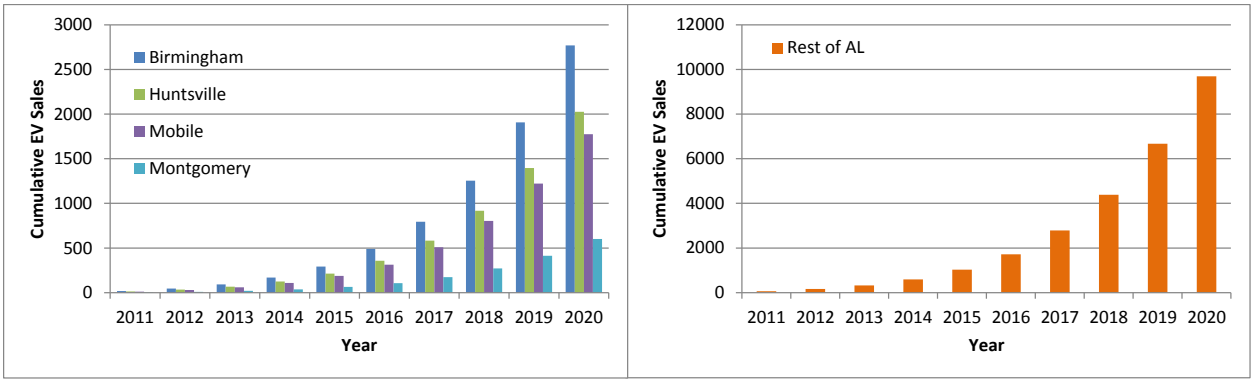

Figure 6 – Cumulative EV Sales Estimates for Alabama

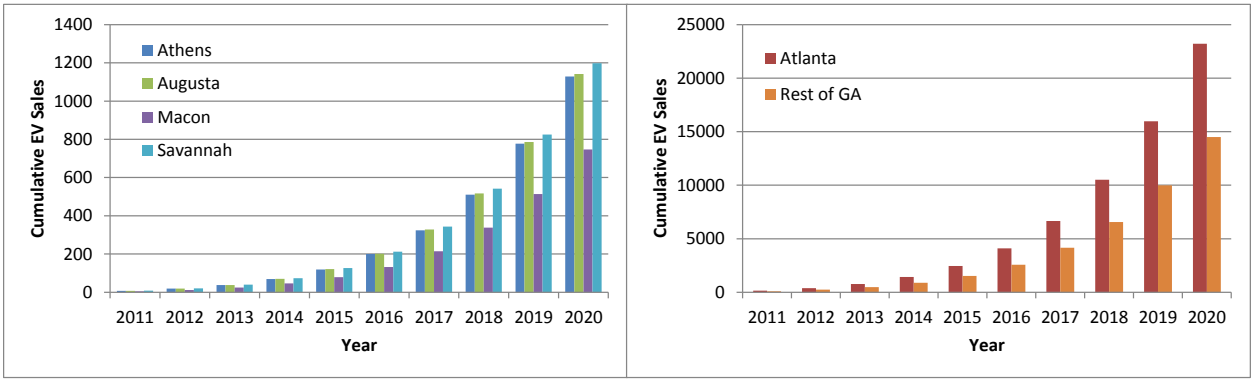

Figure 7 – Cumulative EV Sales Estimates for Georgia

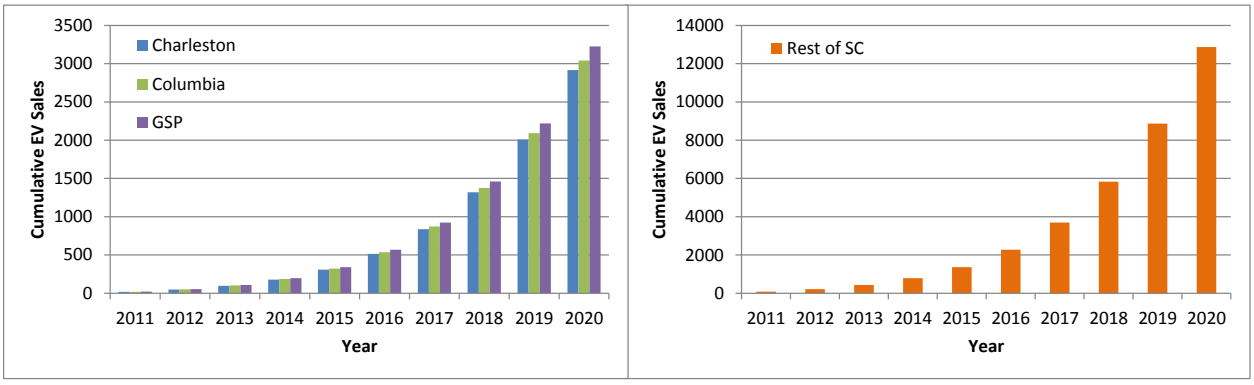

Figure 8 – Cumulative EV Sales Estimates for South Carolina

The estimated cumulative EV demand for 2015 and 2020 is listed in Table 4.

Year	Alabama	Georgia	South Carolina	Total
2015	1,785	4,435	2,332	8,552
2020	16,866	41,924	22,050	80,840

Table 4 – Estimated Cumulative Tri-State EV Sales

Figure 9 provides a graphical summary of cumulative Tri-State EV sales for the period from 2011-2020.

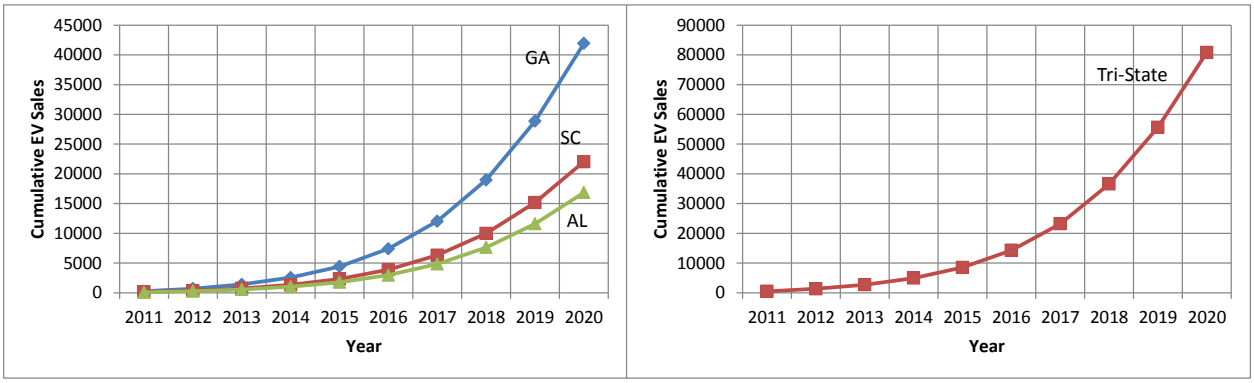

Figure 9 – Cumulative EV Sales Estimates for the Tri-State Region

2.2.2. Accelerated Adoption

The baseline case assumes that EVs will enter the market at a similar rate and size as current hybrids. However, some current market conditions differ from the introduction of hybrids. Key among those is the Federal government support to the auto industry and the large Federal government subsidy of $7,500 per vehicle as well as state subsidies of as much as $5,000, which may increase the rate of adoption. Other factors also may converge to increase both the rate of adoption and total market size. These include the significant recent increase in gasoline prices, as well as recent tension in the Middle East, which could curtail the flow of oil from that region. In addition, the Federal government has announced that they intend to increase the Federal incentive to $10,000 per vehicle, to convert it to a point of sale rebate rather than a tax refund, to cover more vehicle models, and to eliminate the current individual model cap and replace it with a phase out of the program at the end of the decade.

The studies reviewed suggest that if these changes occur, they would result in approximately a factor of two increase in the rate of EV adoption, as shown in Table 5. Therefore, an accelerated adoption profile of double the annual sales of the baseline case was generated to account for the increased likelihood that these influences on the market may occur.

Study	Scenario	2015 Estimate	2020 Estimate
Gaining Traction (2)	Conservative	0.3%	1.9%
	Probable	0.4%	3.1%
	Aggressive	0.5%	5.6%
Deployment Rollout Estimate of EVs (3)		0.9%	N/A
Comeback of the Electric Car (5)	Slowdown	N/A	1%
	Steady Pace	N/A	5%
	Acceleration	N/A	10%
The E-Mobility Era (6)	Little Change	N/A	7%
	Basic Scenario	N/A	25%
	Fundamental Change	N/A	50%

Table 5 – Adoption Rates Based on External Factors

This would result in the adoption profiles shown in Figure 10. Under these conditions, the goal of having 100,000 EVs registered in the tri-state would occur in the 2018-2019 timeframe, approximately 2 years earlier than under the baseline scenario.

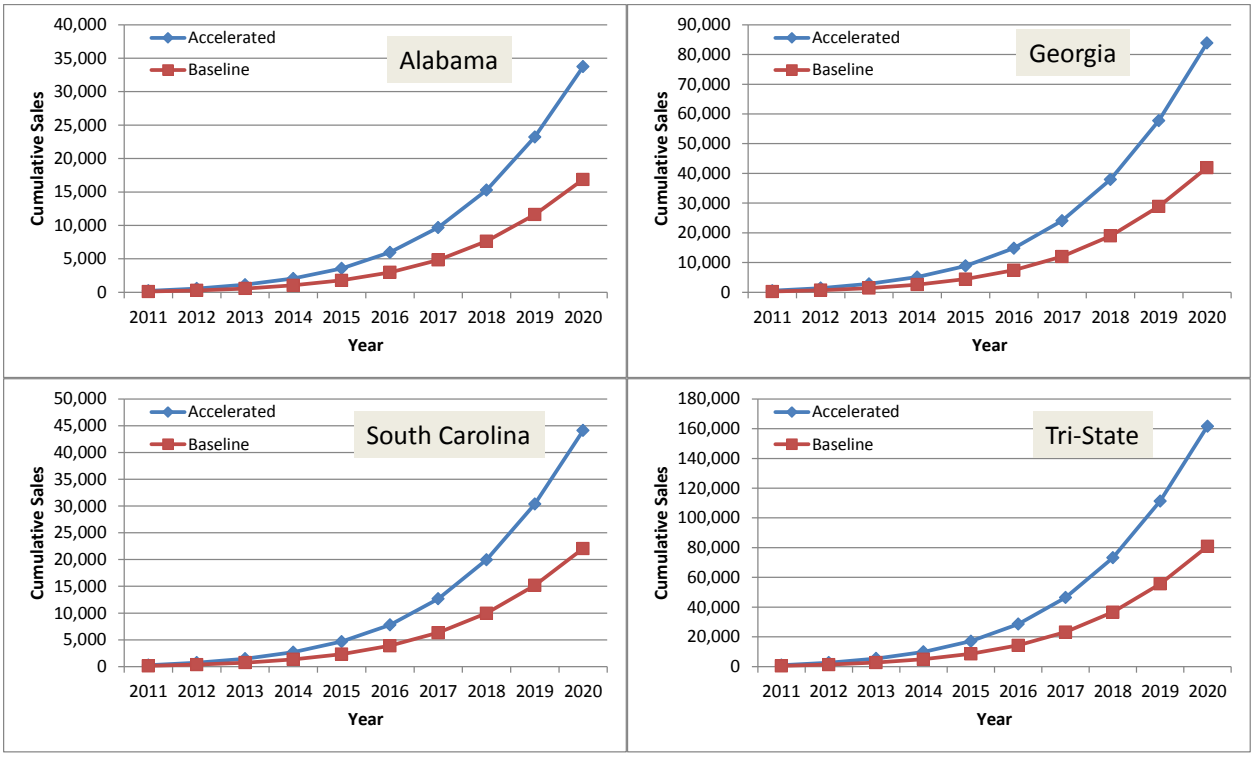

Figure 10 – Accelerated Adoption Profiles for the Tri-State

3. Elasticity of Demand

Most of the available studies present results based on multi-variable scenarios, e.g. a combination of gas prices, vehicle prices, and assumed levels of environmental regulations. This makes it difficult to determine the estimated impact of a single variable. Four studies that provide some single variable analysis are summarized here.

Plug-in Hybrid Electric Vehicles. (11) This study used interviews conducted with a nationally representative sample of 2,513 adults between July and November of 2008 to assess their knowledge and opinions of PHEVs. Their study found that vehicle cost had a significant impact on probability of purchase, as shown in Figure 11. The data are for PHEVs with an assumed 75% fuel cost savings over conventional ICE vehicles. Note that even with this substantial fuel savings, which would result in a payback period of only 2 years for a PHEV costing $2,500 more than an ICE vehicle, the purchase probability was only 46%. With a $5,000 additional cost, which equates to an approximate 4 year payback period, the purchase probability dropped to 30%, and with a $10,000 surcharge, the purchase probability fell to 14%, even though the payback period of 8 years was still less than the expected life of a typical vehicle, which is greater than 10 years. These results suggest that vehicle manufacturers need to move aggressively to reduce costs and why the Federal government is considering increasing the EV rebates and extending them to the end of the decade.

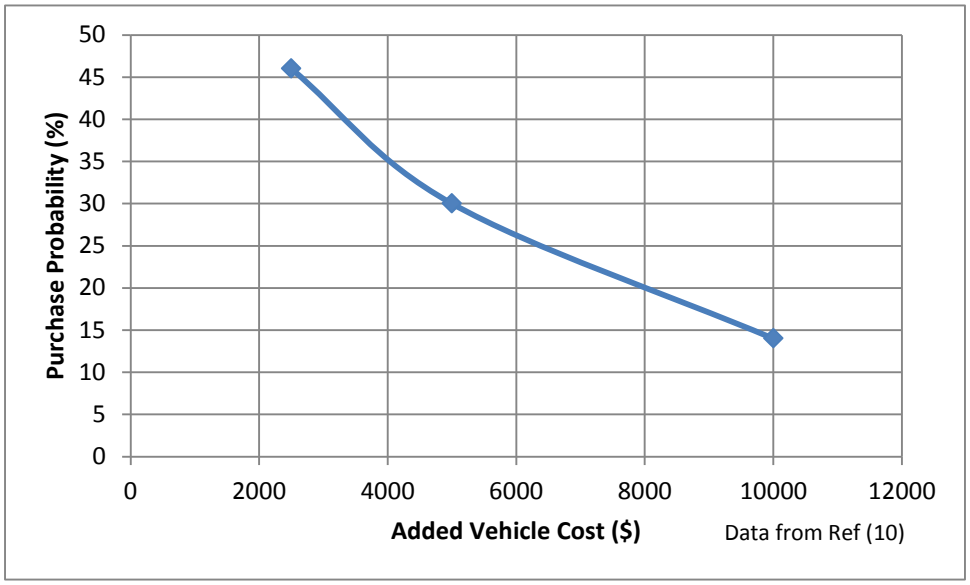

Figure 11 – Effect of Added PHEV Cost on Purchase Probability

The study also looked at how gas prices influenced purchase probabilities. During the survey period, gas prices varied between less than $2.70 per gallon to over $4.14 per gallon. The results, shown in Figure 12, indicate virtually no impact of fuel prices within the range shown, suggesting that fuel prices will need to rise substantially above $4.00/gallon before they will impact PHEV sales. These results are for the same conditions as the added cost survey, i.e. an assumed 75% fuel cost savings for PHEVs.

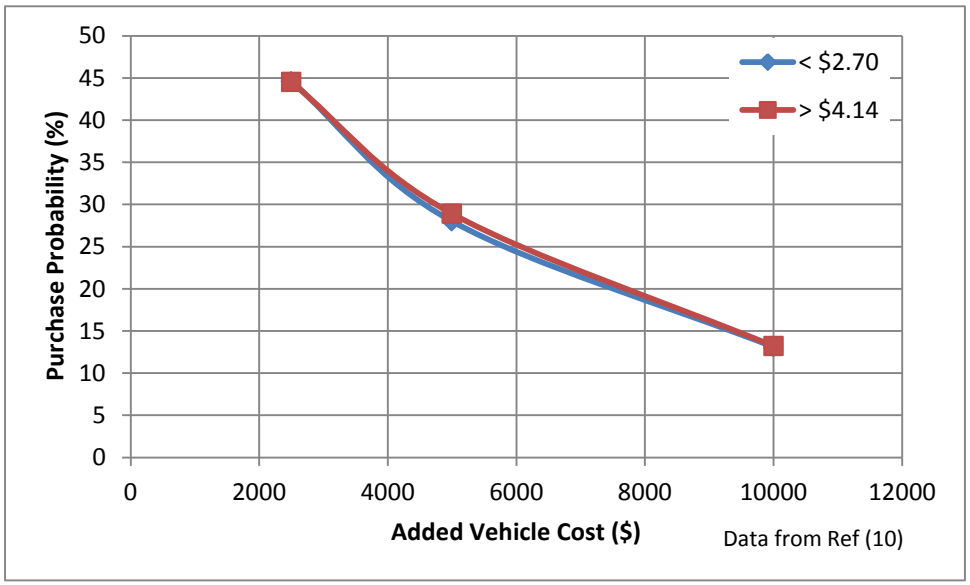

Figure 12 – Effect of Gasoline Prices on Purchase Probability

Realizing the Potential of the Los Angeles Electric Vehicle Market. (12) This study combined the results of a survey of 2,043 participants in the LA metro area with a market share simulation to assess the impact of three factors: (1) federal and state purchase rebates, (2) access to residential charging, and (3) HOV access.

The effect of a $12,500 combined federal and state rebate provided at time of sale (rather than as an income tax reduction received in the following year) was assessed. The study showed that EV sales in

the LA area would increase by about 25% over the number of sales that were estimated to occur without a rebate, as shown in Figure 13. Unfortunately, there is no way of segregating purchasers who would have purchased a vehicle without a rebate from those who changed their purchase choice to an EV as a result of the rebate. Therefore, the $12,500 rebate is paid to all purchasers. This makes the cost **per additional vehicle sold** about $62,500. With vehicles currently costing about $37,000-$40,000, for this scenario, it would have been more cost effective if the governments had used these funds to purchase vehicles directly for government fleets. The same number of additional vehicles on the road would have been achieved at about 60% of the total cost to taxpayers. If the funds were used to offset just the additional cost of an EV for already planned and budgeted government fleet purchases, the impact on taxpayers would be even lower, about 20% of the cost of a retail market rebate (i.e. $12,500 per vehicle purchased).

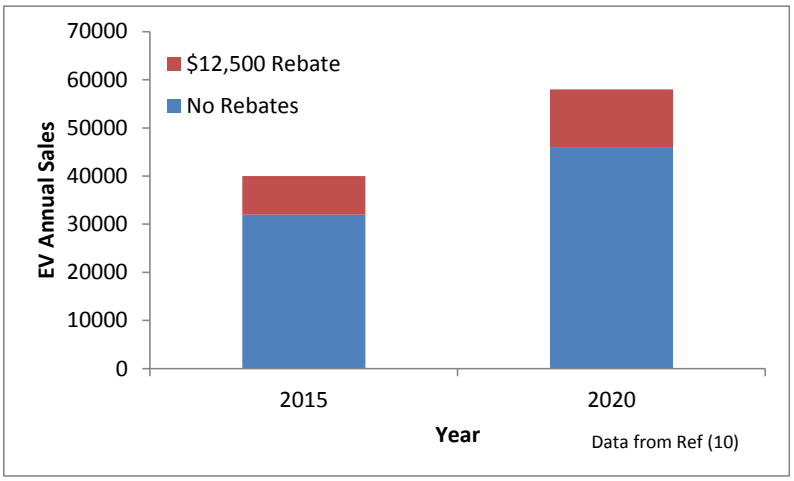

Figure 13 – Effect of Purchase Rebates

A study of LA housing found that only 5% of LA residents in multi-unit dwellings would have access to charging at their homes, while over half of the LA residents surveyed for this study stated that they would not purchase an EV without access to home charging. The study assessed the impact of increasing the access to home charging to 50% of multi-unit dwelling residents. The results are shown in Figure 14. The analysis indicates that increasing access in multi-unit dwellings to 50% would result in an approximate 10% increase in the number of vehicles sold.

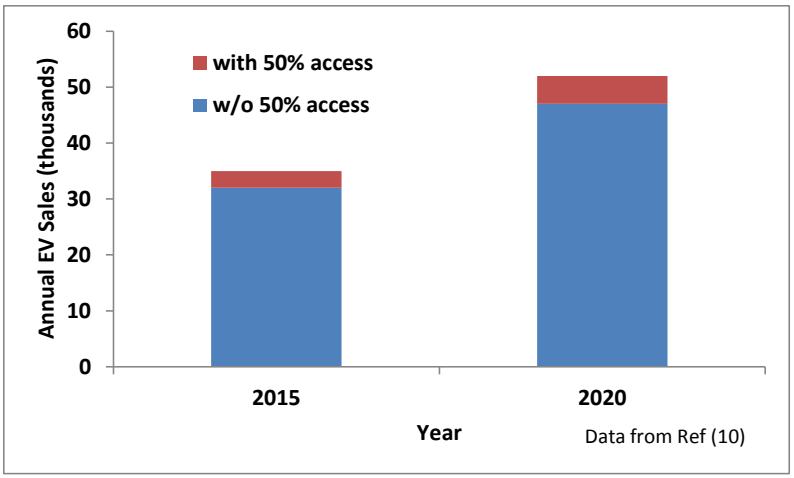

Figure 14 – Effect of Charging Access in Multi-Unit Dwellings

Providing preferential access to HOV lanes during peak rush hours can be an EV purchase incentive in areas where commuting times can be significantly reduced through HOV lane use. The study found that providing EV access to HOV lanes in the LA area would result in about a 5% increase in vehicle sales, as shown in Figure 15. The benefit of this incentive is that it can be provided at no additional taxpayer cost.

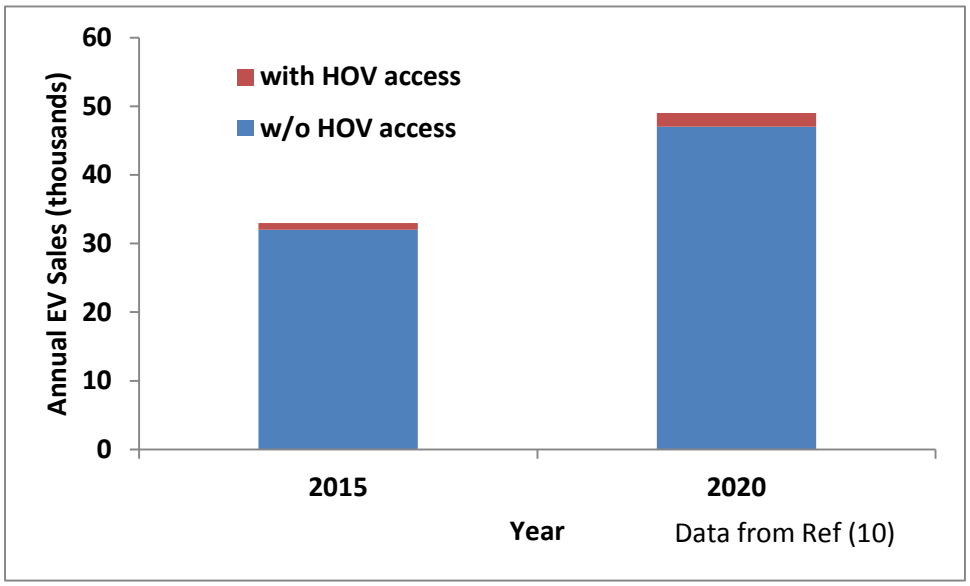

Figure 15 – Effect of HOV Access

Gaining Traction – A Customer View of Electric Vehicle Mass Adoption in the U.S. Automotive Market. (3) In this study, Deloitte surveyed 2,000 vehicle owners on their perception of and interest in EVs. Two questions of importance in that survey were (1) When you evaluate a purchase decision, what are the main costs you think about?, and (2) How much would you expect to pay for an EV? The results, shown in Figures 16 and 17, are consistent with those of Reference 10, reported above, showing the importance of vehicle price on willingness to purchase.

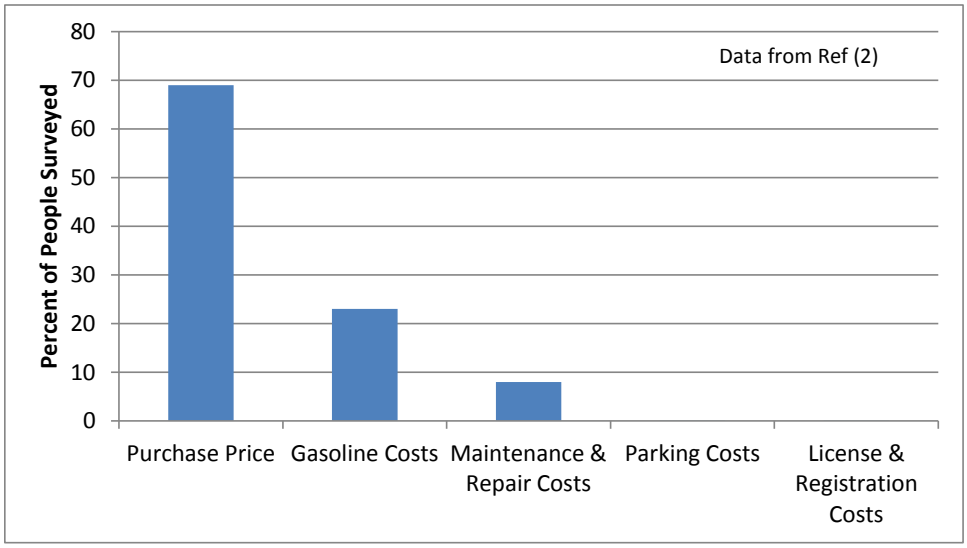

Figure 16 – Major Cost Influences on EV Purchases

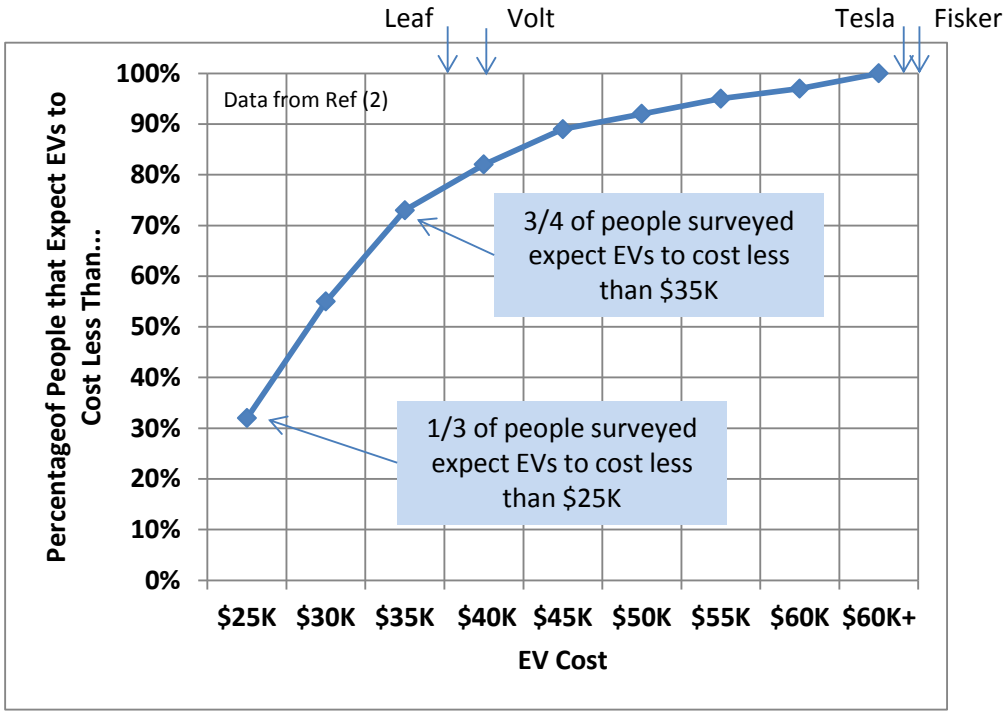

Figure 17 – Price Expectations of Potential EV Purchasers

Giving Green to get Green? The Effect of Incentives and Ideology on Hybrid Vehicle Adoption. (13) This study, by the John F. Kennedy School of Government at Harvard University, analyzed consumer data for hybrid vehicles from 2000-2006. The study used quarterly state-level sales data from JD Power and Associates for each hybrid model to assess the impact of (1) government incentives, including income and sales tax incentives and High Occupancy Vehicle (HOV) lane access, (2) changes in gasoline prices, and (3) environmentalism.

The study looked at two types of tax incentives, income tax incentives and sales tax incentives. The study found that sales tax incentives were more effective than income tax incentives, even though the average value of the sales tax incentives were only ½ as much ($1,037 average sales tax incentive versus $2,011 average income tax incentive). The reason for the greater impact of sales tax incentives is believed to be due to their immediate and automatic application to reduce the vehicle's purchase price, whereas income tax credits must be known, understood, and applied for by the purchaser and are not received until the year following the sale. This study found that the demand for hybrid models that were eligible for sales tax incentives was 28% higher than for those models that were not eligible. It found a 13% increase in demand for hybrid models that were eligible for an income tax credit over models that were not eligible. These results were found to be true, even though the amount of the sales tax credit was, on average, only half the amount of the income tax credit ($1,037 versus $2,011).

In general, the study did not find a correlation between hybrid demand and allowing hybrid vehicles preferential access to HOV lanes, with one exception, Virginia. In northern Virginia, where single occupant hybrids were allowed access to HOV-2 and HOV-3 lanes during rush hours, **a 65% increase in hybrid sales was noted**. These results suggest that where a substantial reduction in commute time can be achieved, HOV access can be a powerful, non-monetary incentive; however, in cases where commute times are not substantially reduced, the impact is minimal. By October, 2003 hybrids accounted for roughly 25-30% of all HOV traffic, which was equivalent to about 1/3 of all hybrid sales in Virginia. This

incentive was so successful, that by 2006, congestion of HOV lanes resulted in Virginia restricting hybrid use of HOV lanes during rush hours.

During the period studied, gasoline prices rose from a national average of $1.41 per gallon in the 2001-2003 time period to $2.61 in 2006. The impact of these price increases was found to predominately affect the purchase of "strong" hybrids, i.e. hybrids with substantially greater fuel economy than similar vehicles in their class, rather than "mild" hybrids that offered only modest improvements in fuel economy. The study estimates that a 10% increase in gasoline prices leads to a 9% increase in per capita sales of high economy hybrids, with the most significant increases coming in states with high average annual vehicle mileage. No correlation with gas price increases was found for mild hybrids.

4. Demographics of Potential EV Adopters

Three studies were reviewed that provided information on the demographics of potential EV adopters.

Plug-in Hybrid Electric Vehicles. (11) This study used interviews with a nationally representative sample of 2,513 adults between July and November of 2008 to identify the demographics of EV households, The study looked at age, income, education, gender, home ownership, geographic region, and environmental commitment.

The study found little difference in the probability of purchasing an EV based on age for consumers under the age of 54, but the probability dropped off sharply above that point, as shown in Figure 18.

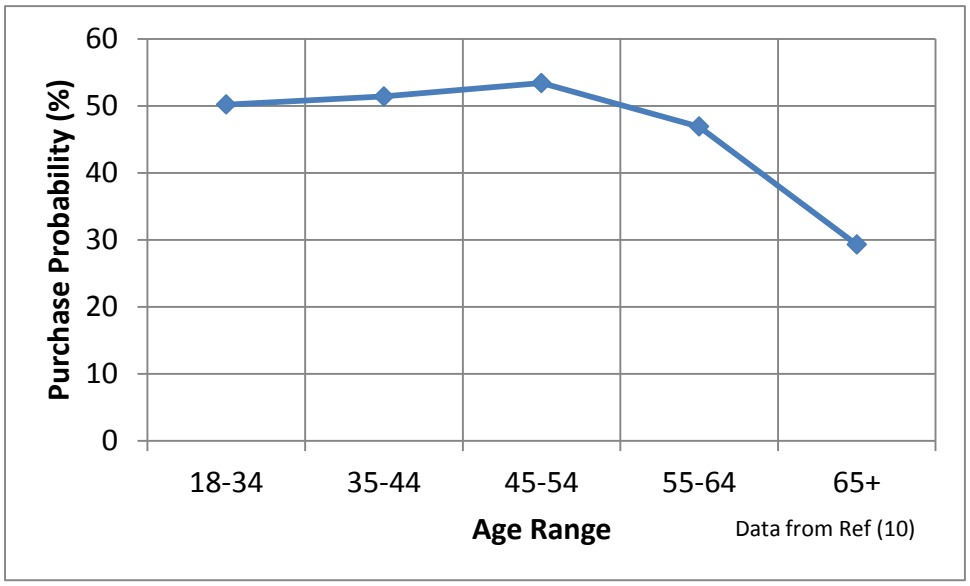

Figure 18 – Influence of Age

As expected, household income proved to be strongly correlated with purchase probability, as shown in Figure 19.

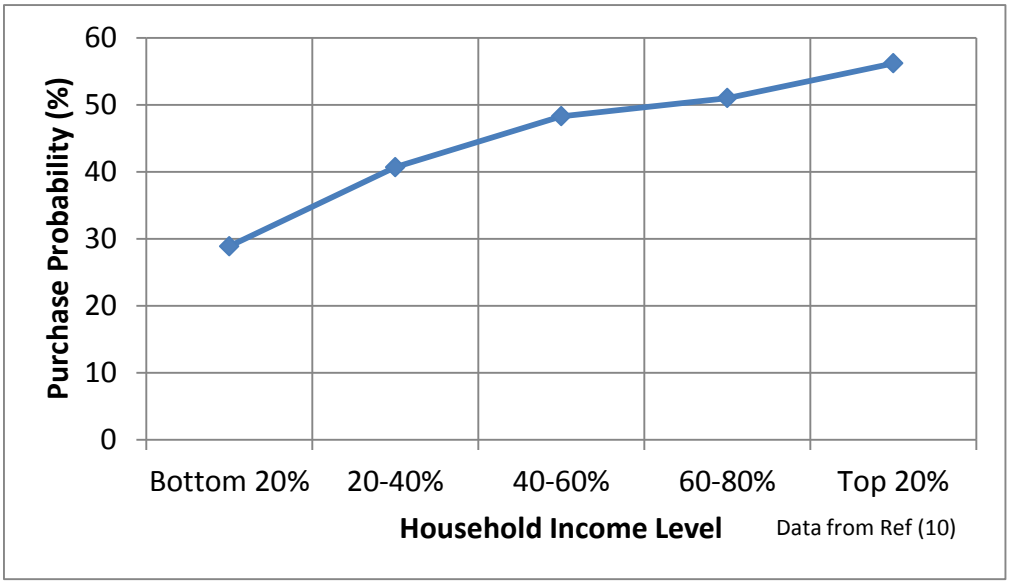

Figure 19 – Effect of Income Level on Purchase Probability

A higher level of education also was associated with a higher purchase probability, as shown in Figure 20.

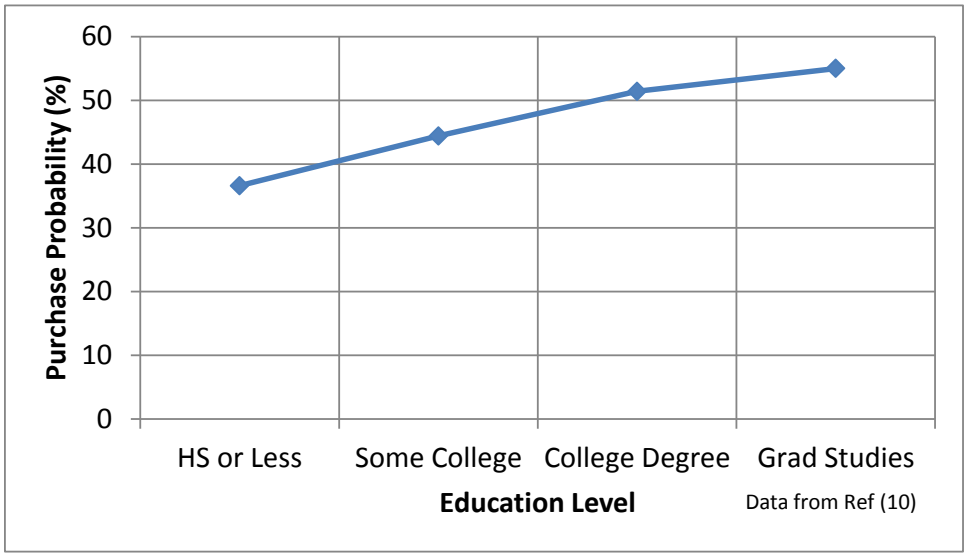

Figure 20 – Impact of Education Level

The study showed a modest correlation between home ownership and purchase probability, with a 46.8% purchase probability for home owners versus a 40.5% probability for renters. It also showed a modest correlation with region of the country, with residents of the West and Northeast being more likely to purchase an EV than residents of the Midwest or South. This result is significant for EV readiness planning in the Southeast. The data are shown in Figure 21.

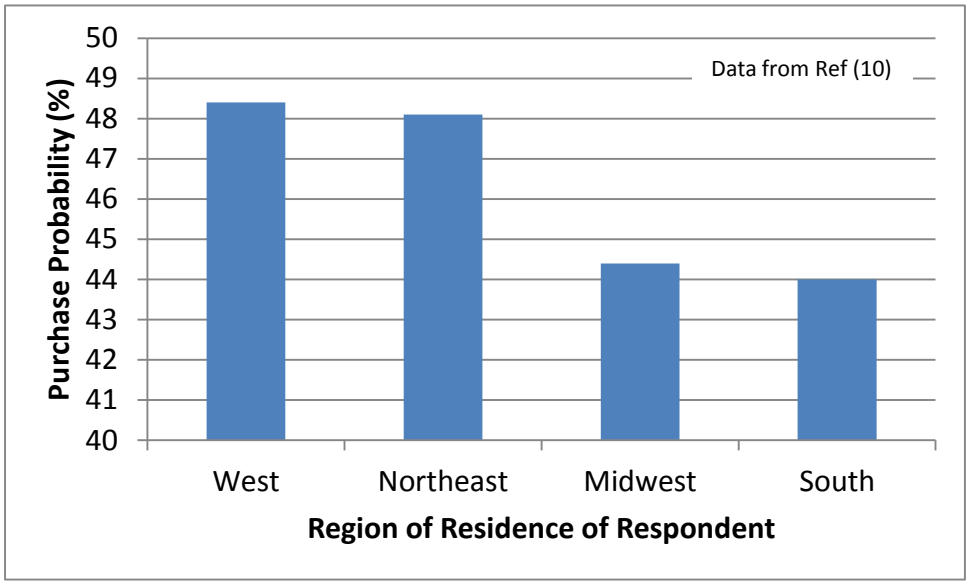

Figure 21 – Regional Influences

Finally, a belief that their purchase would overtly demonstrate their commitment to the environment correlated strongly with EV purchase probability, as shown in Figure 22.

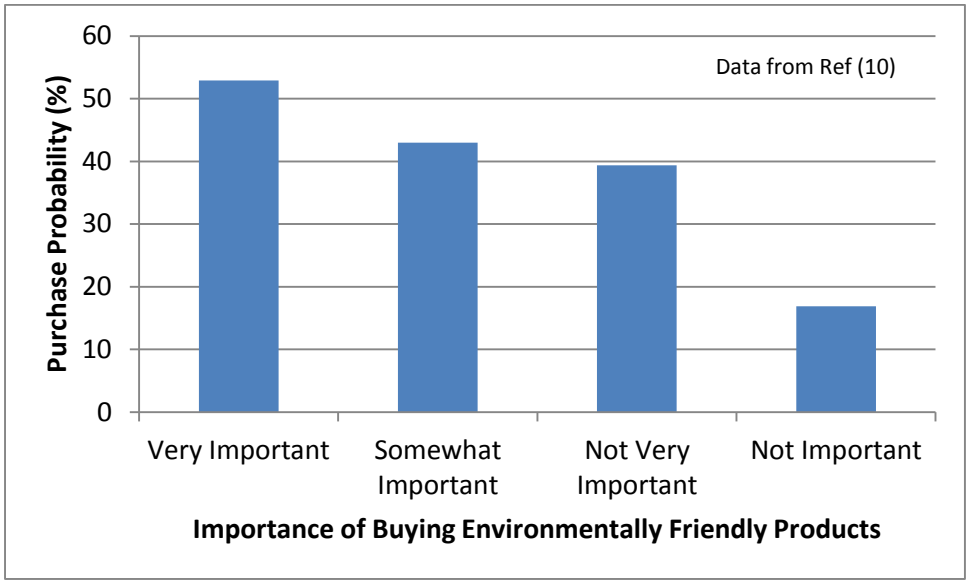

Figure 22 – Impact of Interest in the Environment

Gaining Traction – A Customer View of Electric Vehicle Mass Adoption in the U.S. Automotive Market. (3) Based on Deloitte's survey of 2,000 vehicle owners they developed the following profiles for Early Adopters, Early Majority Adopters, and Non-Adopters.

Early Adopters

- Young
- Very high income (household income greater than $200,000)
- Already own one or more vehicles
- Concentrated in Southern California due to favorable weather and infrastructure

Early Majority

- Average household income of $114,000
- Predominantly male (67%)
- Live in urban or suburban locations
- 88% have a garage and access to power
- Drive 100 miles per week on average
- Top purchase influence is reliability

Non-Adopters

- Perceive EVs as expensive
- Top purchase influence is price
- Average household income of $54,000
- No gender bias (49% male / 51% female)
- Live in suburban and rural locations
- 36% have no garage and access to power
- Drive 600 miles per week on average

Giving Green to get Green? The Effect of Incentives and Ideology on Hybrid Vehicle Adoption. (13) This study, which analyzed consumer data for hybrid vehicles from 2000-2006, found four demographics of interest. The study found that hybrid sales were significantly correlated with per capita income and average age. A one standard deviation increase in per capita income was associated with a 24% increase in hybrid sales. Hybrid sales were negatively correlated with age, with younger drivers being more likely to adopt new hybrid vehicle technology. The study found no statistically significant correlation between gender or educational attainment and hybrid sales. The study also found a positive correlation between individuals that expressed a strong interest in the environment and hybrid sales. Using membership in the Sierra Club as a proxy, the study found that a one standard deviation in Sierra Club membership per capita was associated with a 17 percent increase in hybrid sales.

5. EVSE Distribution Requirements and Grid Impact

The purpose of the EVSE distribution requirements and grid impact task was to estimate the additional grid loading that will result from the introduction of EVs into the tri-state, the magnitude of the load, where that loading is expected to occur, and the portion of it that would occur at home, at work, and at other destinations. Twelve urban areas were chosen for analysis, because the demographic data suggested that early EV purchases would be concentrated in these areas. These 12 urban "core clusters" were:

Alabama Clusters	Georgia Clusters	South Carolina Clusters
• Birmingham • Huntsville • Mobile • Montgomery	• Athens • Atlanta • Augusta • Macon • Savannah	• Charleston • Columbia • Greenville-Spartanburg

Table 6 – Core Clusters

5.1.Method

The method used for this study built on a simulation model that was developed to support EV planning for Greenville County, South Carolina. (14) A more thorough description of the model and its data sources can be found in that report. Several improvements and revisions were made to the model in support of this study, including better management of work trips and the ability to post-process data for changes in EV quantities and geographic distribution. For this study, Level 2 EVSE were assumed to be available at all home, work, and other destinations with parking times of two hours or more.

5.2.Simulation Inputs

Core cluster zip codes. From the center of each of the 12 core clusters, all contiguous zip codes with a population density exceeding 500 people per square mile were included, consistent with the US Census Bureau's definition of an urbanized area. In addition, any contiguous zip codes which had a high density of hybrid vehicles also were added to account for less dense areas that have EV-likely residents.

EV distribution. EV's were distributed based upon the current distribution of hybrids in the tri-state, e.g. if a zip code had 1% of the total registered hybrids in the state, then 1% of the EVs were assigned to that zip code. The total number of EVs in the tri-state varied, depending upon the year being simulated.

Daily work trips. Data from the Federal Highway Administration's Census Transportation Planning Products (CTPP) was used to allocate the work trips of EV drivers, both those living within the core cluster and those living outside the cluster who commute into the cluster for work.

Destinations. Destinations, other than work, were input, along with their type, e.g. malls or recreation facilities. The types of destinations selected were those where it was expected that the EV would be parked for at least 2 hours, so that the driver was likely to take the time to plug in and the amount of charging would be significant. Each destination was geocoded.

Driver profiles. Ten profiles of typical EV drivers were created based on expected EV driver demographics. These profiles were used to create trip schedules that matched the profile. The driver profiles included:

- Whether the driver worked or not (e.g. was retired or a stay at home parent)
- Their vehicle type (i.e. PHEV or BEV), model year, and electric range
- Income level

Trip schedule. Each of the ten driver profiles had four trip schedules. They were:

- Normal weekday (assumed to occur 4 days per week)
- Heavy weekday (assumed to occur 1 day per week)
- Normal weekend (assumed to occur 2 days per week)
- Vacation (assumed to occur once every 6 months)

Each day in the trip schedule had up to four trips to work or other destinations.

5.3.Simulation Outputs

The output of the simulation is the annual energy consumed in each core cluster zip code, broken down by charging at home, work, and other destinations. The annual energy consumed is based upon the total number of EVs that are assumed to be in the tri-state in the year being simulated. For this study, two EV quantities were used, based upon the results of the EV demand study described above. The quantities used were 8,550 and 100,000 which are the estimated number of EVs that will be registered in the tri-state in 2015 and 2021 according to the baseline demand case. These quantities occur in 2014 and 2019 respectively for the accelerated demand case.

The amount of energy consumed for the 2015 baseline case is so small that there should be no impacts of consequence to the grid, therefore, the results presented below focus on the 100,000 vehicle case.

5.4.Results

For 100,000 registered EVs in the tri-state, it is estimated that almost 54,000 of those EVs would be registered in the core cluster zip codes, with additional EVs commuting from zip codes outside the cluster into the core. Based on the simulation results, the impact on the core cluster zip codes would be a total of approximately 186,500 MWh of electricity consumed annually. This total consumption is divided as shown in Table 7. These results are based upon the assumption that all locations were equipped with Level 2 EVSE and that vehicles would charge wherever a charger was available. Based on this level of energy usage, 100,000 vehicles in the tri-state would consume less than 0.1% of the electricity generated in these three states in 2010. (15)

Charge Location	Energy Consumed (MWh)	% of Total Energy
Home	105,537	57
Work	48,868	26
Other	32,116	17
TOTAL	186,522	100

Table 7 – Energy Consumption for 100,000 EV Case

5.4.1. Residential Charging

Figure 23 shows the distribution of the 105,537 MWh of residential charging energy consumed annually within the core zip codes that form the twelve tri-state clusters. Almost 2/3 of the zip codes have annual residential charging levels of less than 400 MWh.

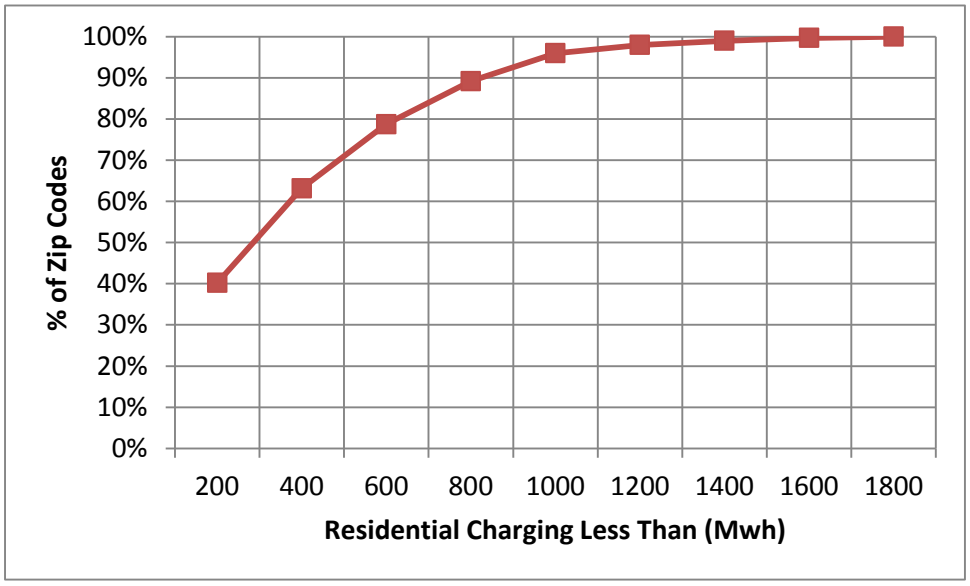

Figure 23 – Distribution of Residential Charging within the Tri-State Core Clusters

Using the zip code with the highest amount of annual residential energy use (1,792 MWh), five equal intervals were established to subdivide the residential charging results. Three zip codes fall within the highest interval (1440-1800 MWh) and seven fall within the second highest interval (1080-1440 MWh). Nine of those ten zip codes are within the Atlanta cluster and are shown in Figure 24. The remaining residential zip code is in the Charleston cluster, shown in Figure 25.

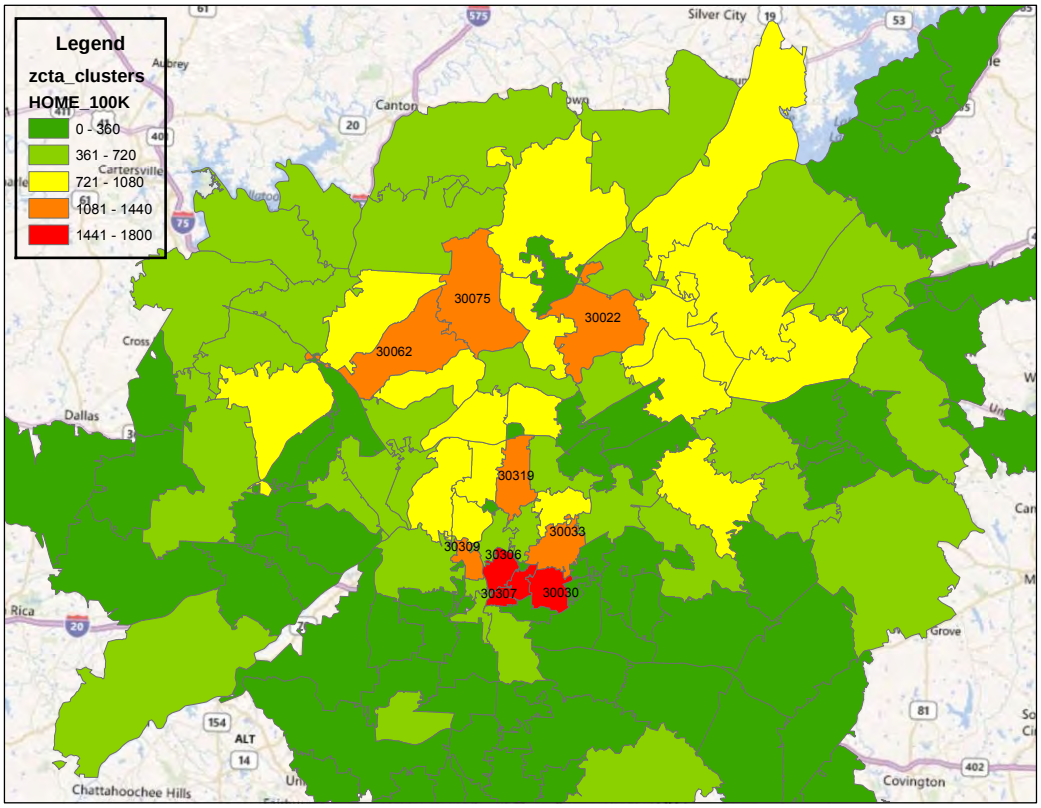

Figure 24 – Atlanta Zip Codes with the Highest Levels of Residential Charging

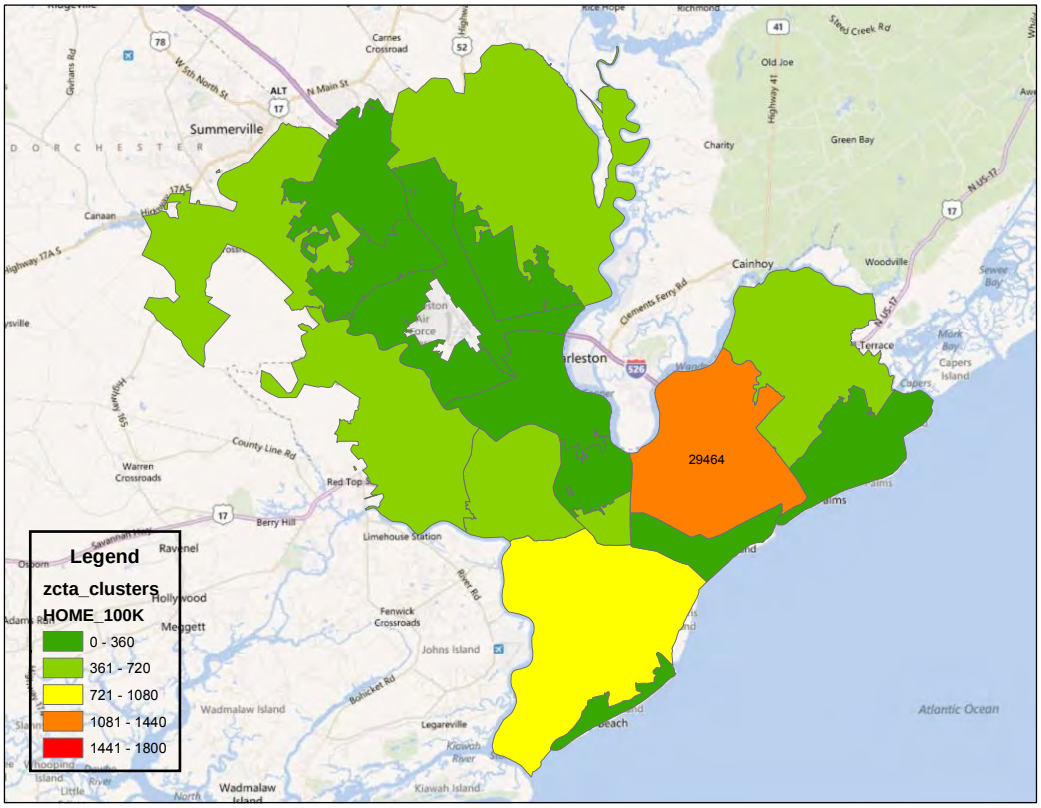

Figure 25 – Charleston Zip Codes with the Highest Levels of Residential Charging

5.4.2. Work Charging

Figure 26 shows the distribution of the 48,868 MWh of annual work charging among the core zip codes that form the twelve tri-state clusters. Almost 2/3 of the zip codes have annual work charging levels of less than 150 MWh.

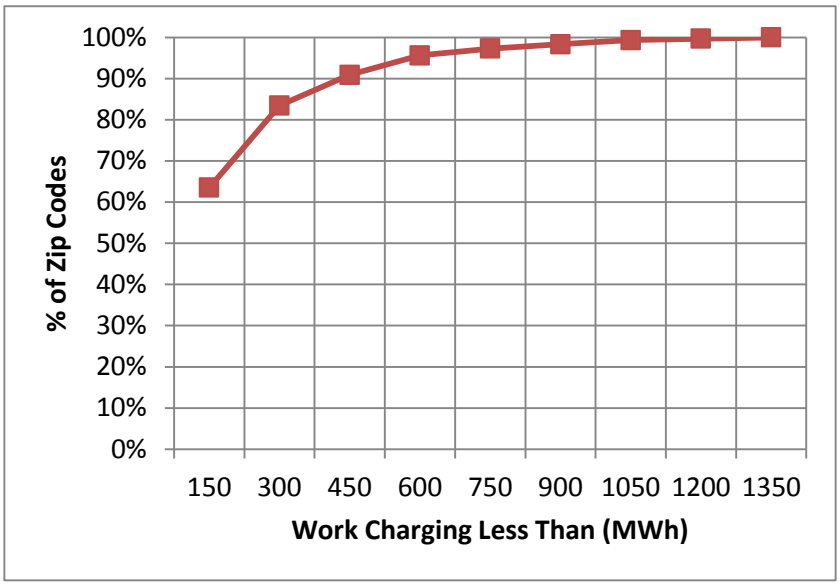

Figure 26 – Distribution of Work Charging within the Tri-State Core Clusters

Using the zip code with the highest amount of annual work charging (1,319 MWh), five equal intervals were established to subdivide the work charging results. Two zip codes fall within the highest interval (1060-1325 MWh) and five fall within the second highest interval (795-1060 MWh). Six of those seven zip codes are within the Atlanta cluster and are shown in Figure 27. The remaining work zip code is in the Columbia cluster, shown in Figure 28.

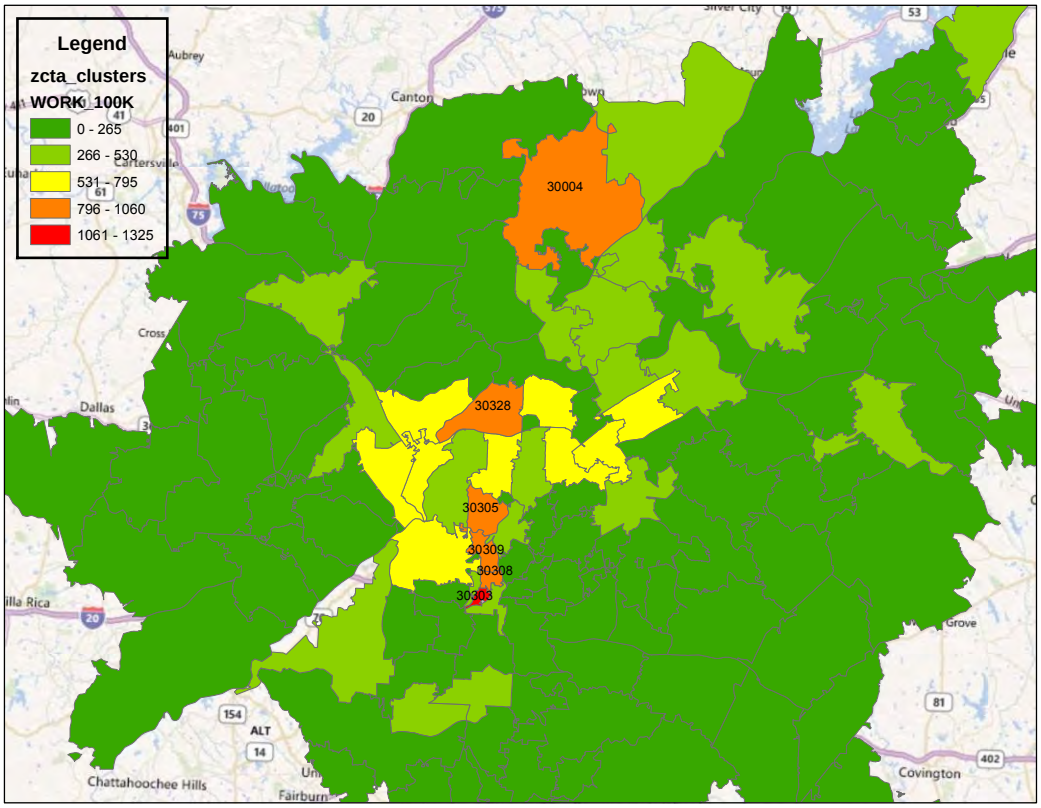

Figure 27 – Atlanta Zip Codes with the Highest Levels of Work Charging

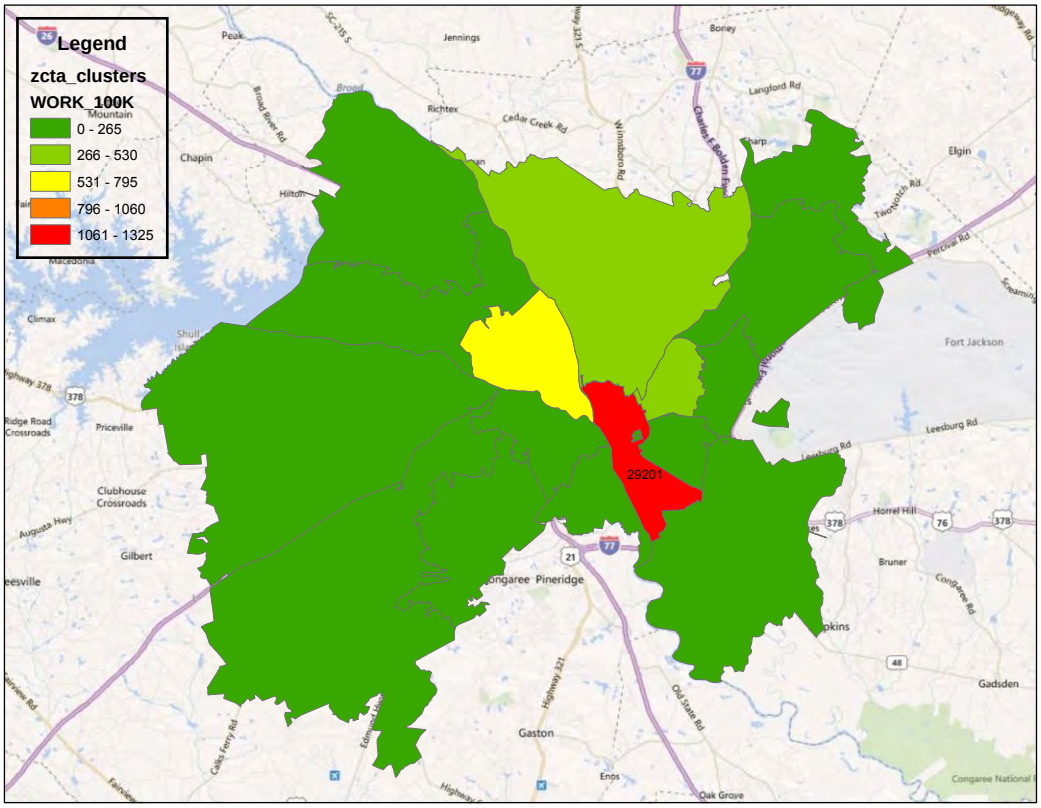

Figure 28 – Columbia Zip Codes with the Highest Levels of Work Charging

5.4.3. Other Charging

Figure 29 shows the distribution of the 32,116 MWh of annual charging at other destinations among the core zip codes that form the twelve tri-state clusters. Almost 2/3 of the zip codes have annual "other" charging levels of less than 100 MWh.

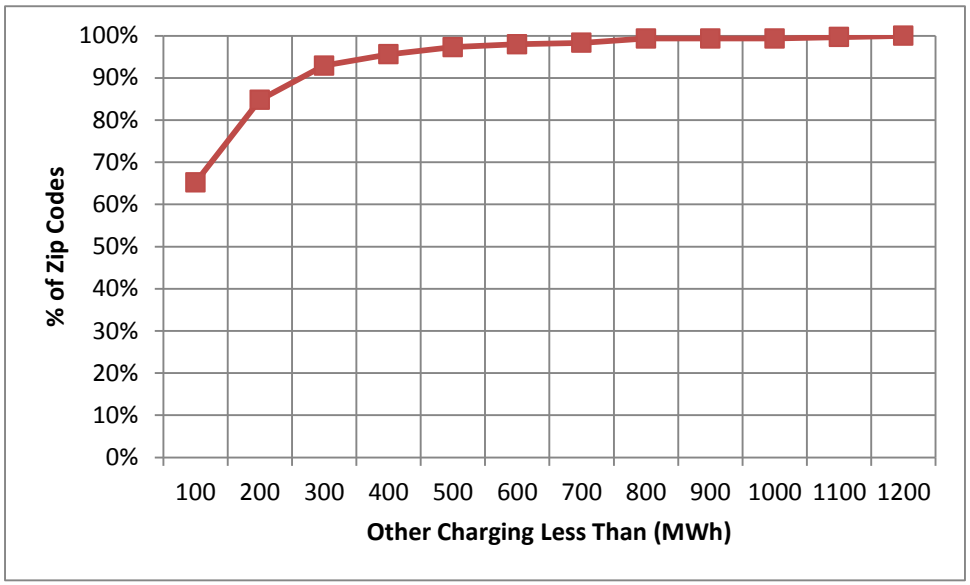

Figure 29 – Distribution of Other Charging within the Tri-State Core Clusters

Using the zip code with the highest level of annual energy use at other destinations (1,166 MWh), five equal intervals were established to subdivide the other destination charging results. Two zip codes fall within the highest interval (940-1175 MWh) and two fall within the second highest interval (705-940 MWh). All four of those zip codes are within the Atlanta cluster and are shown in Figure 30.

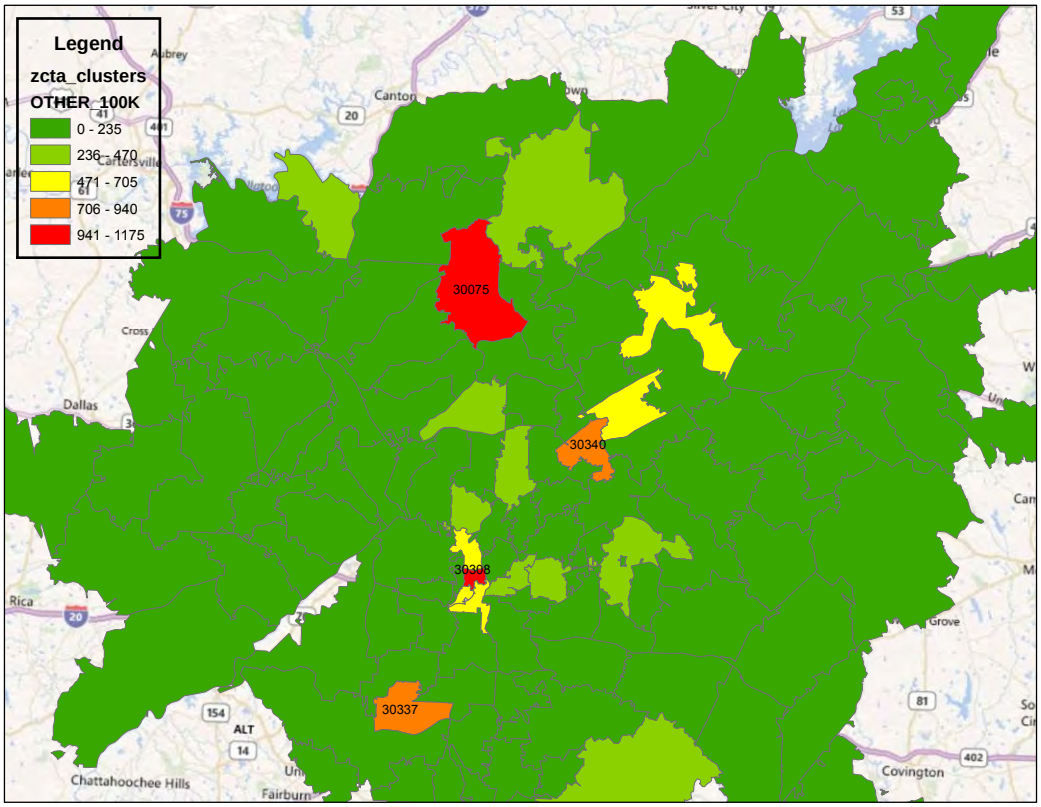

Figure 30 – Atlanta Zip Codes with the Highest Levels of Other Charging

5.5.Analysis

5.5.1. Residential Charging

The simulations for the twelve tri-state clusters indicated that 57% of all charging would be done at home. The Idaho National Labs Plug-in Electric Vehicle Demonstration report (16) indicated that the EVs in their demonstration program were plugged into their home Level 2 EVSE an average of 11.5 hours per day, but reached full charge in an average of only 2.2 hours. In the tri-state, most of these 11.5 hours will occur during utility off peak hours (for example, Southern Company's peak hours are from 2-7 PM, Monday through Friday, during the months of June to September). Assuming the utility can control the charge time for each vehicle, either through demand side management or via time-of-use rates, there is significant flexibility to "valley fill", keeping charging away from peak periods. Even using a Level 1 EVSE, which requires about three times as long for a recharge, there still is significant latitude to shift charging away from the peak.

5.5.2. Workplace Charging

The simulations indicated that workplace charging would account for 26% of all charging. Using work trip data from the Birmingham simulation run as an example, Table 8 shows the percentage of work trips that fall below the "electric miles driven" listed in the first column. Columns three and four show the amount of time required to recharge these vehicles, given a Level 1 or Level 2 charger. Assuming vehicles arrive at work between 7 and 9 AM, all charging can be completed prior to peak hours with Level 2 EVSE, assuming adequate excess power is available, and even with Level 1 EVSE, 80-100% of the vehicles can be charged prior to 2 pm.

Electric Miles Driven	% of Trips (Cumulative)	Level 1 Charge Time (hr)	Level 2 Charge Time (hr)
5	7	1.05	0.35
10	26	2.10	0.70
15	49	3.15	1.05
20	64	4.20	1.40
25	79	5.25	1.75
30	92	6.30	2.10
35	99	7.45	2.45

Table 8 – Workplace Charging Estimates for Birmingham AL

5.5.3. Public Charging

Unlike residential and workplace charging, public charging stations, which accounted for 17% of all charging in the simulation, offer less opportunity for shifting away from peak, even with Level 2 EVSE, because of the expected shorter duration of parking at these locations and because these short duration charging events will sometimes occur entirely within peak hours. So, unlike home and work charging, where the goal is to shift when EVs charge, the goal of on-peak public charging is to shift where EVs charge, i.e. to get EV owners to delay charging until off-peak hours after they reach their home or work charging station, reserving on-peak public charging to premium or emergency charging only through Time of Use (TOU) rates and education. For the BEV owner the equation is simple: if the BEV driver is confident of making it to a home or work EVSE, that driver may be dissuaded from using public EVSE on-peak. If they cannot reach their home or work destination, then some limited amount of charging will be necessary. For the PHEV driver, the equation is more complicated. Using a Volt as an example, the cost per mile of travel on gasoline is about 11 cents at $4.00 per gallon. The electric equivalent to this is about 32 cents per kilowatt-hour. The most aggressive EV TOU pricing found was Pacific Gas and Electric, whose 2 to 9 PM charging rate is 28 cents per kilowatt-hour, a 4-2/3 multiple of their 6 cents per kilowatt-hour off-peak rate. In the Brattle Group's paper on the effect of TOU pricing on EV charging patterns, they suggest a "potent" multiple of 8 to affect a "significant demand response". (17)

Several electric energy providers are using or experimenting with TOU rates to determine their influence on shifting charging times, and that data will likely become meaningful and available prior to EVs having a significant effect on peak loading. EV manufacturers are already moving to make TOU charging simple for EV owners. For example, OnStar recently announced (18) that, working with Google, they will be able to set charge times without having to interface with the EVSE. This means that an EV owner could sign up for TOU rates and implement them without having a special EVSE or TOU meter.

5.5.4. Total Load

Most research by utilities and third parties concludes that electric power generation, transmission, and much of the distribution system will be able to handle the added demand from EVs for the foreseeable future, and in many ways be helped by them to the extent that their charging can be used to smooth out demand. This is not always true at the end point of service. Among many others, the Public Utilities Fortnightly, in a June 2011 article, (19) mentions "the cul-de-sac factor", also known as "central correlation" or "clustering" with EVs concentrated in wealthy and environmentally conscience residential areas and places of work.

The cul-de-sac factor can result in loads that exceed the rating of local transformers, when charging occurs simultaneously at peak times and high rate EVSE are used, resulting in potential transformer overloads. One of the solutions to this is to predict "hot spots" and replace the transformers with

higher load rated units. The simulation results provide preliminary indications of the zip codes most likely to be affected by the cul-de-sac factor. Using the zip code with the highest amount of total annual energy use (2,588 MWh), five equal intervals were established to subdivide the total charging results. Seven zip codes fall within the highest interval (2080-2600 MWh) and seventeen fall within the second highest interval (1560-2080 MWh).

Atlanta, which is expected to have over half the EVs in the clusters and over one-quarter of the EVs in all three states has all seven zip codes in the highest charging load interval, and eleven of the seventeen zip codes in the second highest interval. Nearby Athens has one additional zip code in the second interval. These zip codes are highlighted in Figure 31. While Atlanta is significant with over 1/2 of the clusters' expected EVs, it becomes even more significant with 3/4 of the zip codes (18 of the top 24) with the highest total load.

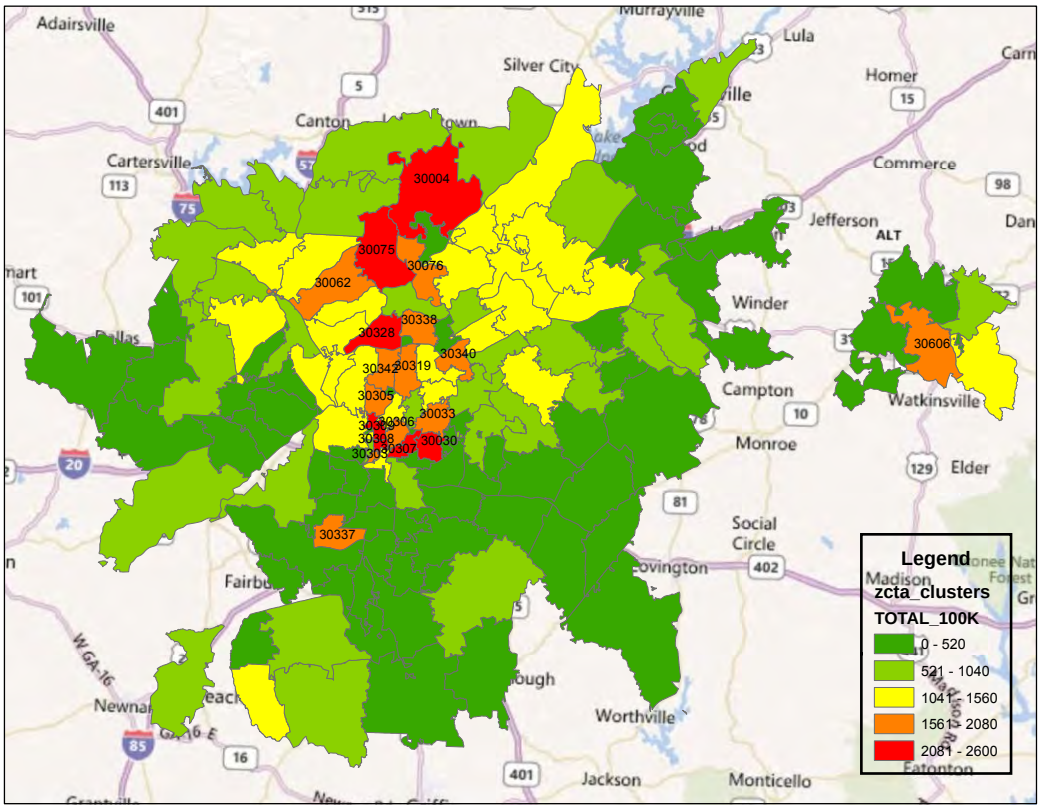

Figure 31 – Atlanta-Athens Zip Codes with the Highest Levels of Total Charging

Four of the remaining five zip codes with high levels of total charging energy usage are in the three South Carolina clusters. South Carolina's three clusters are similar in EV count and total EVSE electrical energy consumption. Their difference is in what drives the total charging energy levels. Results for Charleston and Columbia are shown in Figures 32 and 33. The high total in Charleston's 29464 zip code is driven by a very high home charging level, whereas the high total in Columbia's 29201 zip code is driven by predicted high levels of workplace charging. Zip code 29464 is an affluent suburb of Charleston with a median home value of over $400,000. (20) Zip code 29201 is the central business district of the state's capital. The conclusion is that the simulation matches the obvious: the charging load will be high at night in residential communities that fit the EV driver demographic and high during the day in places where people of the EV demographic work and shop.

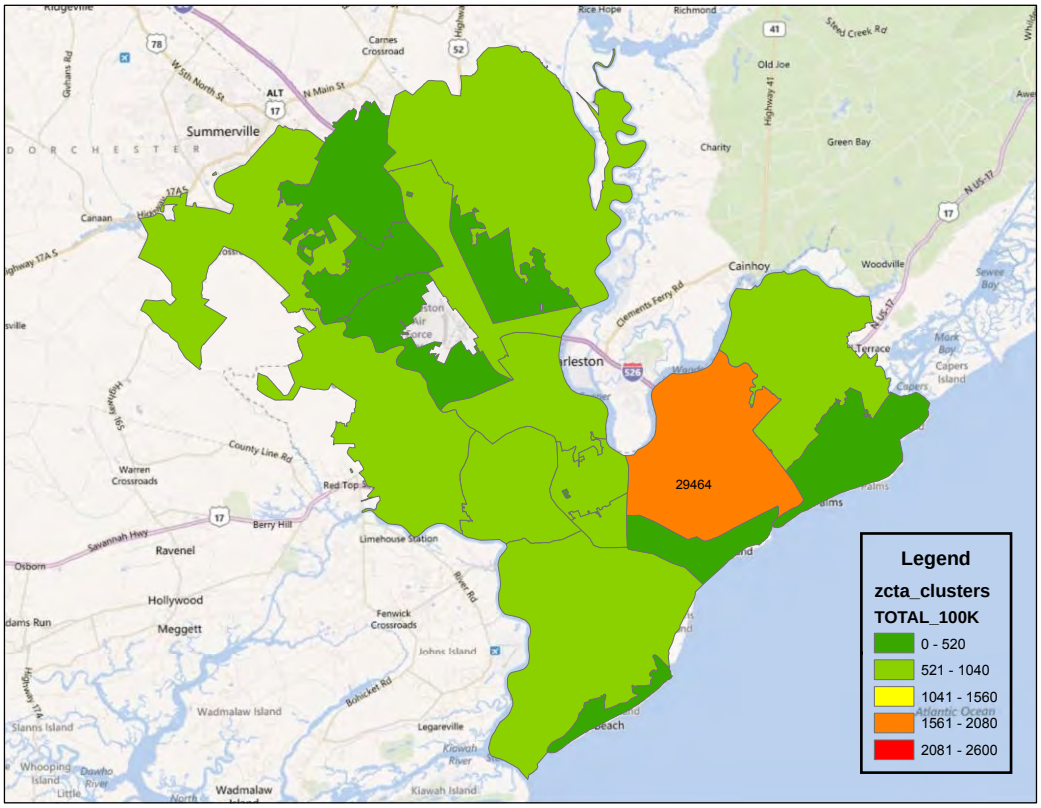

Figure 32 – Charleston Total Charging Levels

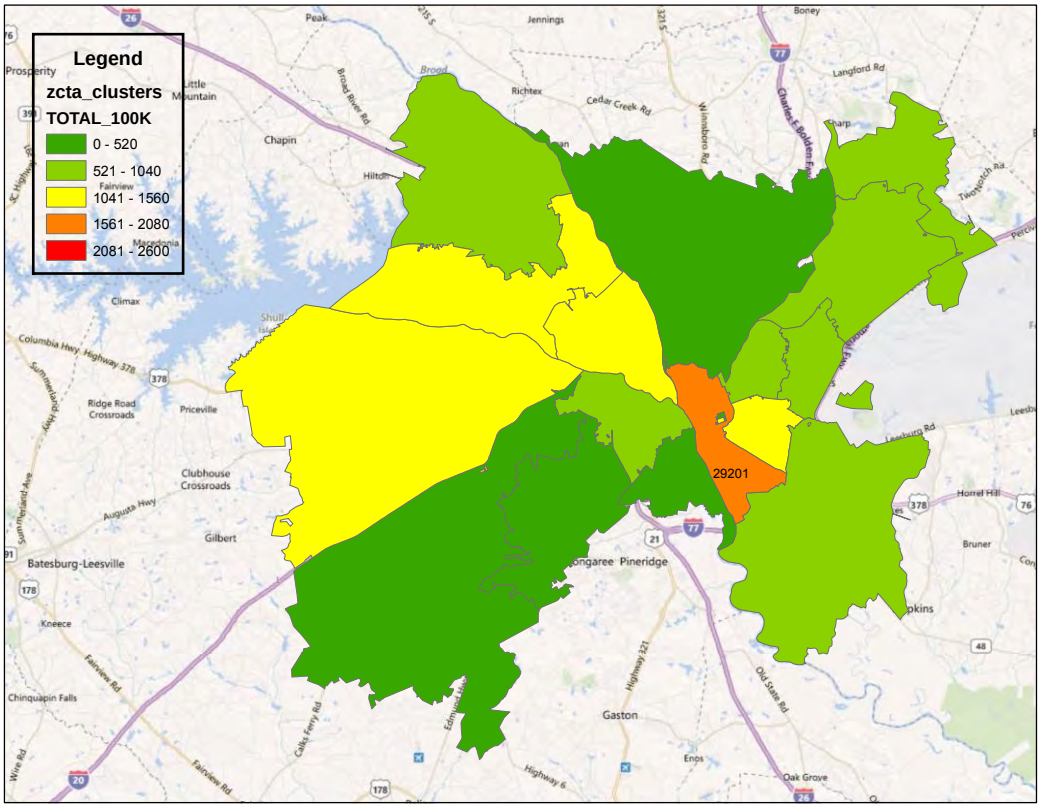

Figure 33 – Columbia Total Charging Levels

Greenville-Spartanburg's two zip codes with high charging levels are different. They are contiguous zip codes which straddle I-85, as shown in Figure 34. There is a mix of residential, industrial, and shopping areas, (20) none of which glaringly fit an EV demographic but each of which tends toward that demographic. In these two zip codes, the three types of EVSE locations all combined to put total EVSE charging in the top 10% of the clusters' zip codes.

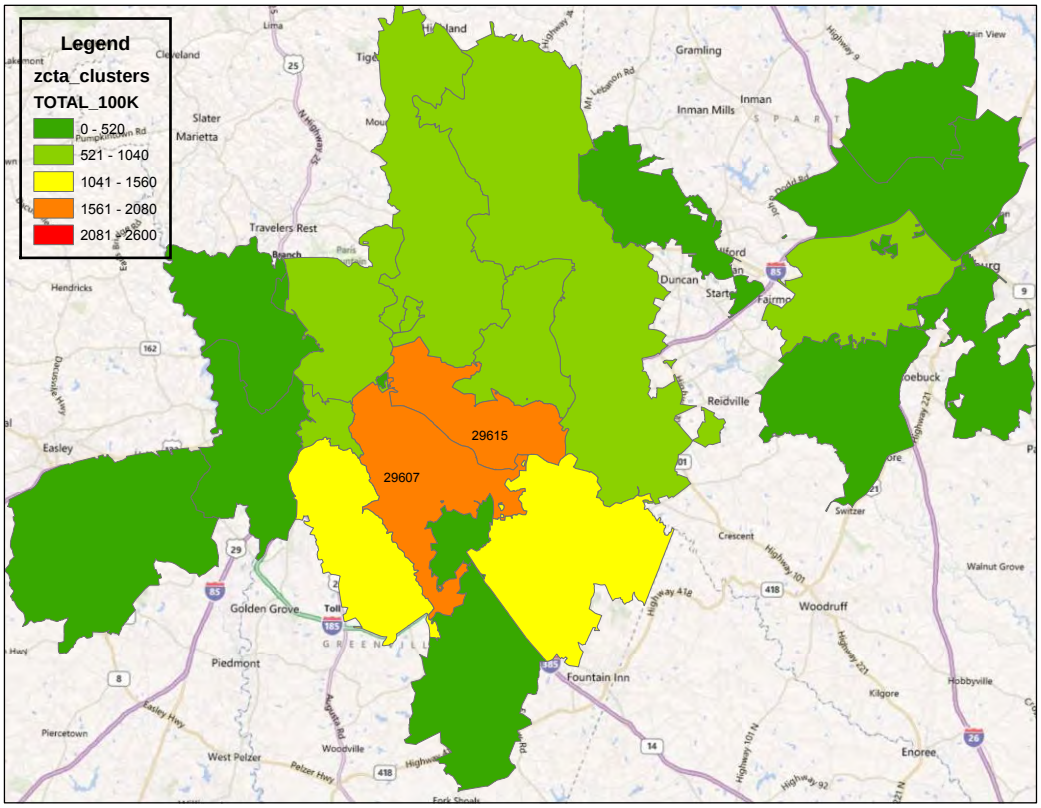

Figure 34 – Greenville-Spartanburg Total Charging Levels

The last of the zip codes with high total charging levels is 35801 in Huntsville, shown in Figure 35. Like Greenville-Spartanburg's two zip codes, 35801's high totals are not driven by any one of home, work, or public charging, but by relatively high numbers for all three. What is important to note for this zip code is that there are a lot of high-tech and environmental companies in this zip code, who employ highly educated people. To a high degree, these same people reside there. (20) Roughly 40% of the people who live in 35801 also work in 35801. This was the highest pairing of home-to-work zips in Huntsville, with the next highest at about 25%. Relative to educational levels, the number of professional degrees and Phd's in 35801 is triple the state average. In general, 35801 is a zip code that fits the EV demographic and the people in 35801 tend to work, and probably shop, close to home.

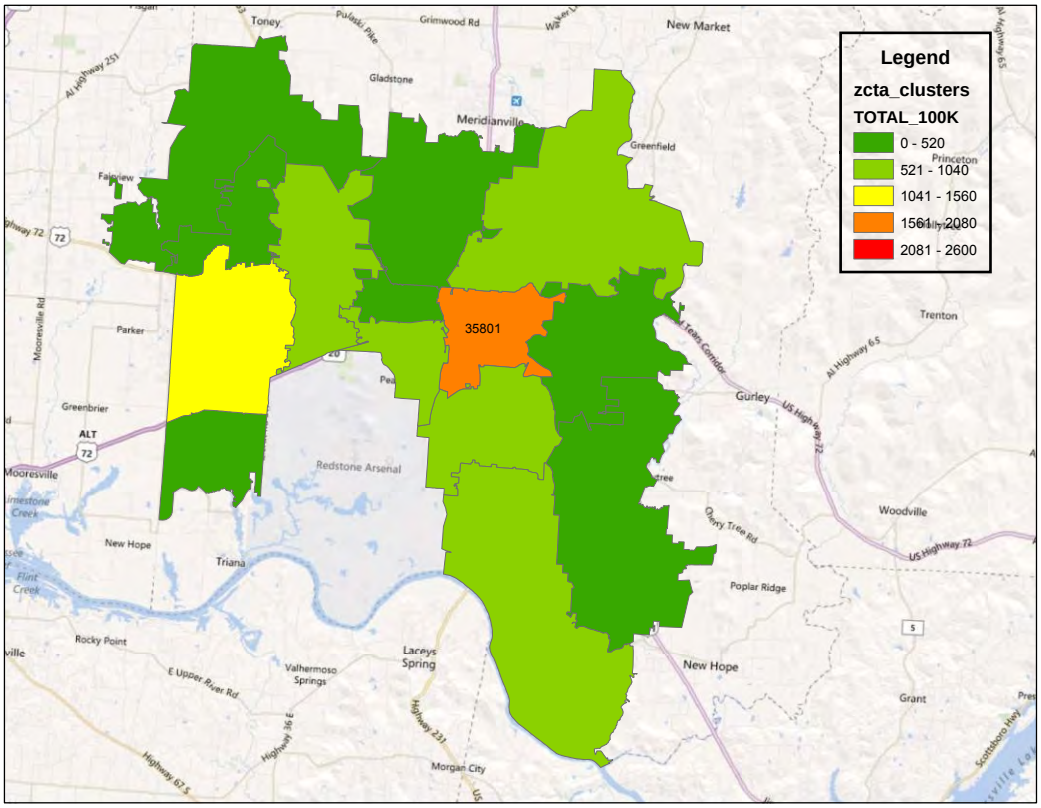

Figure 35 – Huntsville Total Charging Levels

The "yellow" zip codes reflect the third tier of annual total charging (1040-1560 MWh). Birmingham, shown in Figure 36, has one such zip code (35242) driven by home charging. Again, this zip code fits the EV demographic of higher income, highly educated people. The median home value, for example, is slightly less than triple the state average. (20)

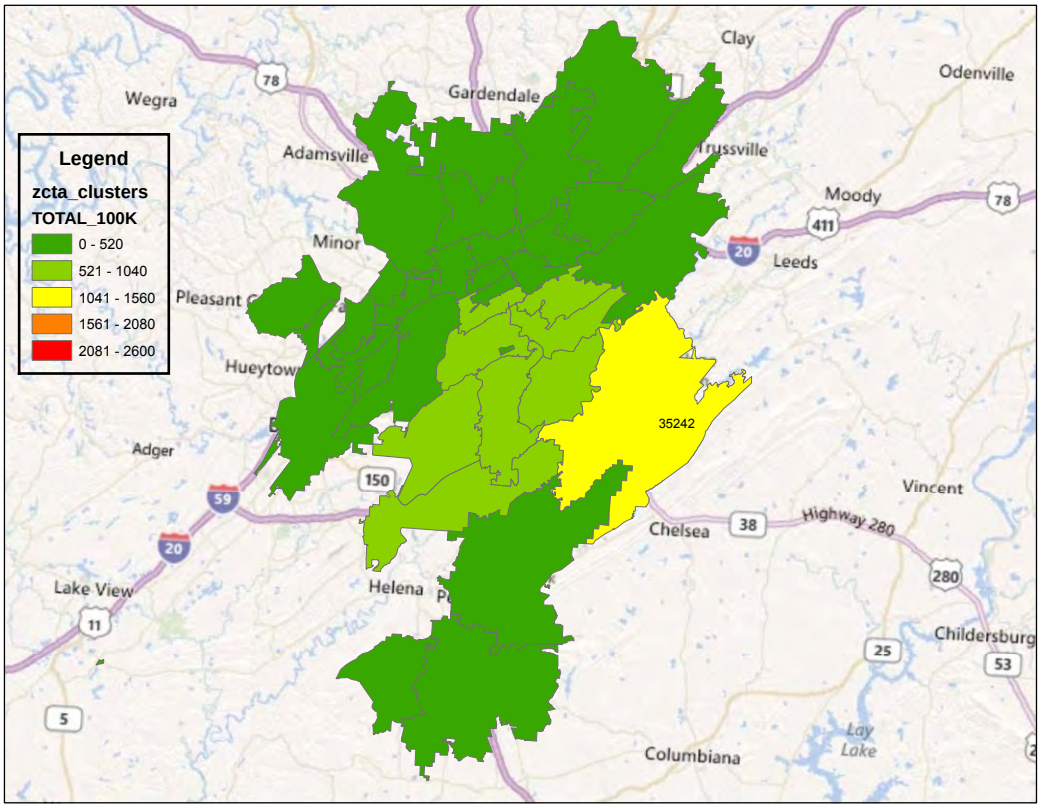

Figure 36 – Birmingham Total Charging Levels

Another zip code with total charging in the yellow range is 30901 in Augusta, shown in Figure 37. Residents in this zip code do not fit the EV demographics, (20) but these high charging levels are driven by work charging, not home charging. Looking at the zip codes from which people drive to 30901, such as Aiken, South Carolina, the demographics make more sense, but still do not totally explain the high work place charging numbers. The rest of the explanation for the high workplace charging level is the sheer number of people commuting into 30901, twice that of the next highest Augusta zip code.

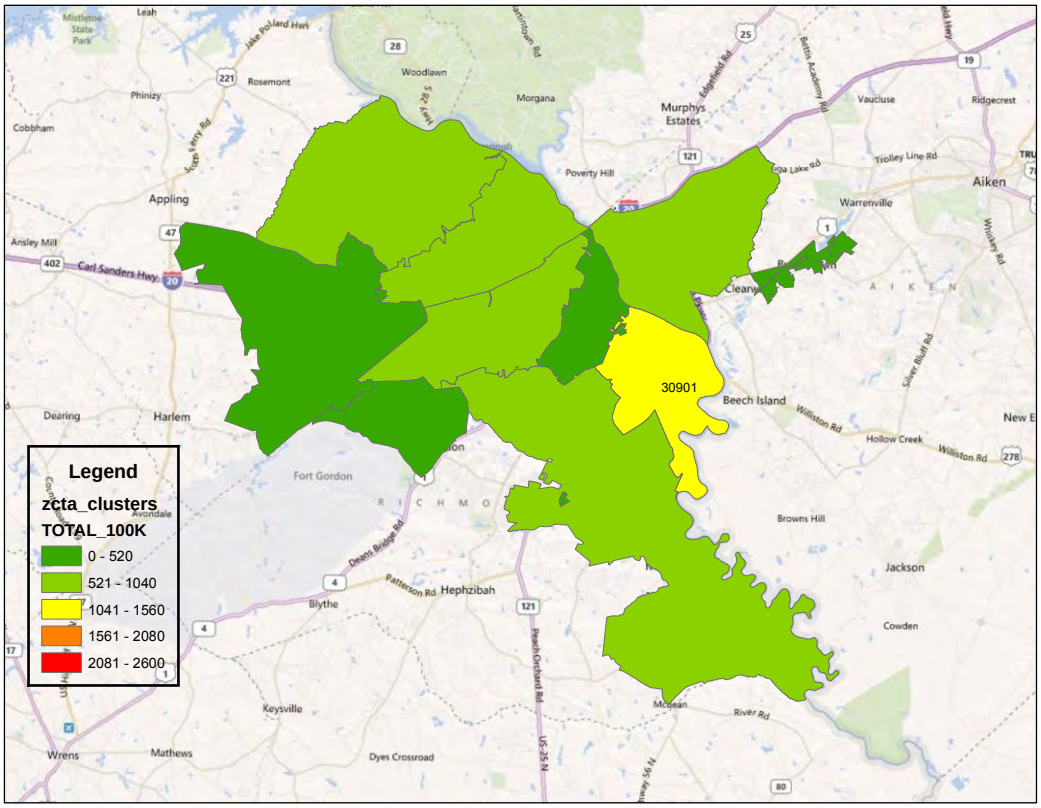

Figure 37 – Augusta Total Charging Levels

The remaining clusters not described are shown in Figures 38-41.

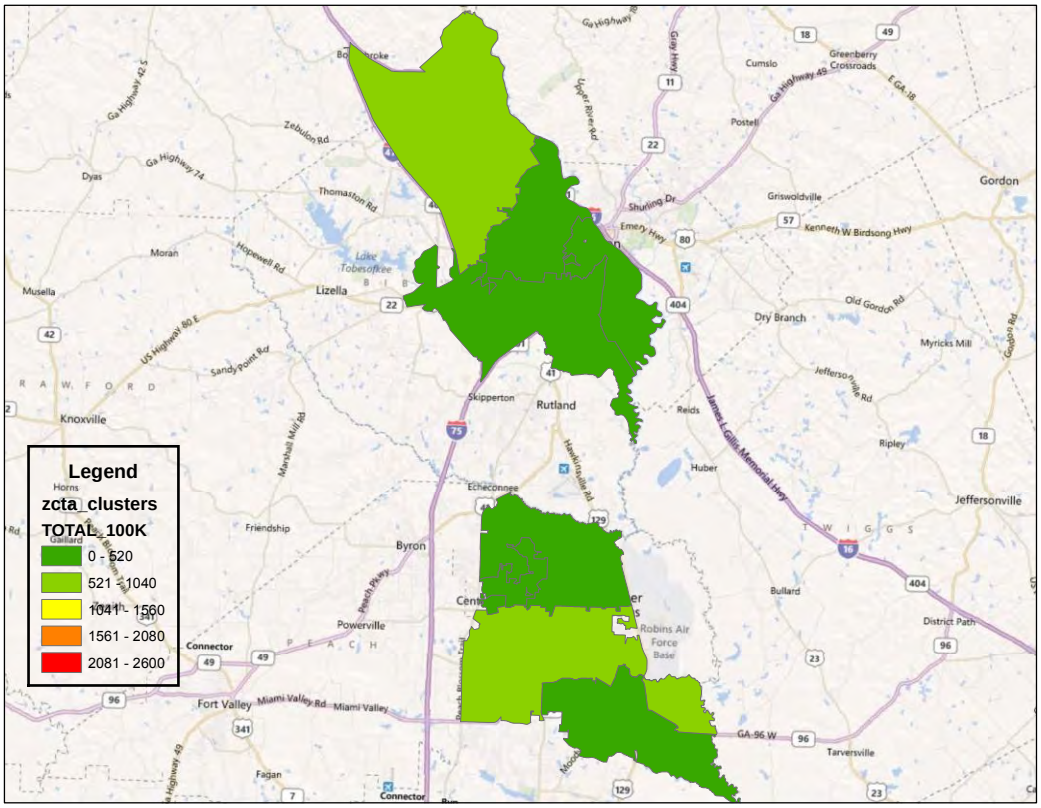

Figure 38 – Macon Total Charging Levels

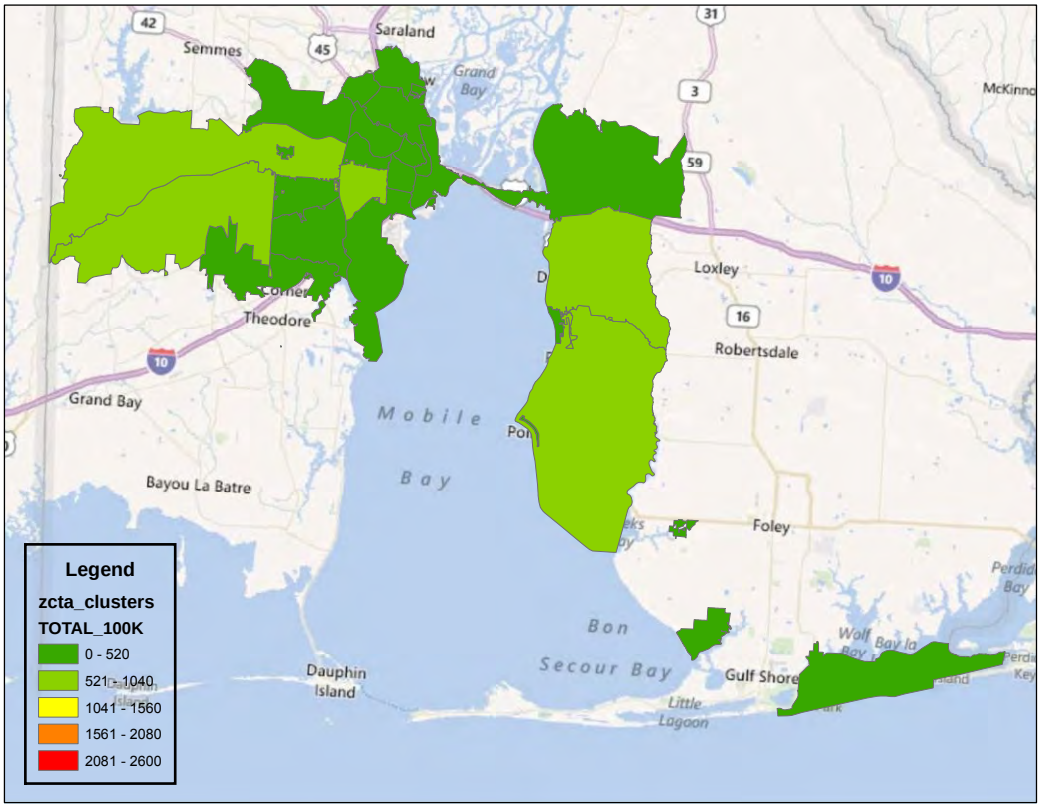

Figure 39 – Mobile Total Charging Levels

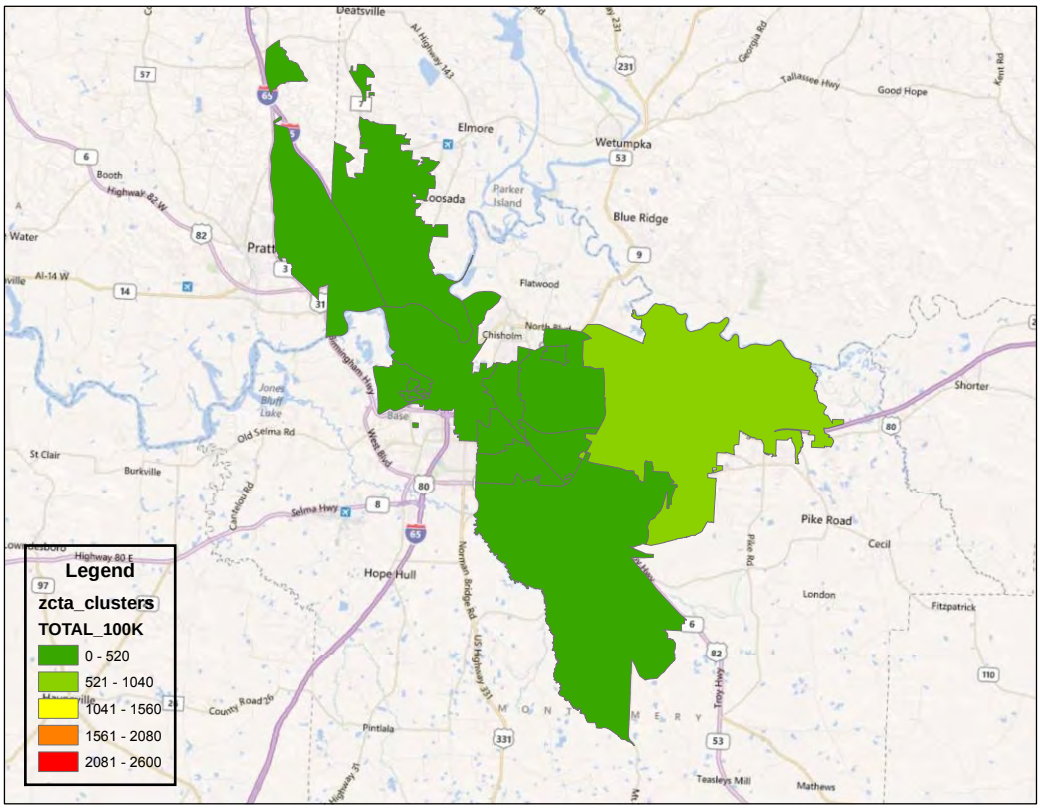

Figure 40 – Montgomery Total Charging Levels

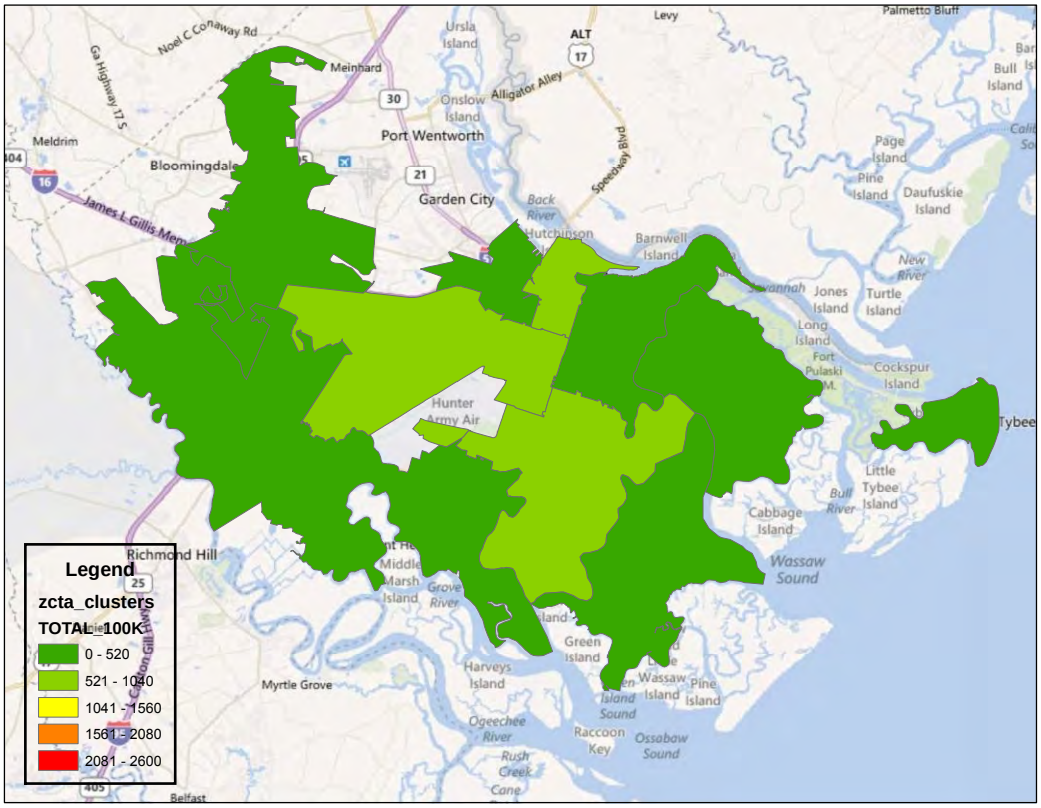

Figure 41 – Savannah Total Charging Levels

5.6.Limitations

- The data are only resolute to zip codes, and are only for the core clusters. However, commuting into the core clusters from zip codes outside the cluster also is included, so the results for the clusters are thorough.
- The data presented are annual totals; however, daily and seasonal calculations are made within the simulation, but are not presented here due to the sheer volume of information. In addition, existing experimental data can be used to convert the totals presented to time-based data if desired.
- The proxy used for EV distribution was 2011 Prius registrations. This proxy has been widely used in similar studies, but as actual EV sales data becomes available, the predictions can be improved.
- While charging at specific destinations was calculated in the simulation, such specific data are not adequate for EVSE placement purposes due to the coarseness of the destinations used and the simple algorithm that was used to select driver destinations. However, the simulation is capable of prioritizing EVSE placements, as described in the Future Uses section below.

5.7.Future Uses

The simulation was proven in its upgraded form and has extensive data applicable to several potential future uses. A few examples are:

- Different numbers or distributions of EVs
- Prioritizing EVSE placement at identical locations, e.g. all stores of the same type, so that the patron would always choose the closest of these destinations
- The benefits of Level 1 versus Level 2 charging at home, work, and other destinations
- Support of time-of-use impact analysis

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Appendix

The following tabular data (in MWh/yr) are for the case of 100,000 EVs in the tri-state (of which approximately 54,000 are located in the core zip codes of the 12 clusters listed below).

Cluster Totals

	Home	Work	Other	Total
Totals	105,537	48,868	32,116	186,522
%	57%	26%	17%	100%

Megawatt-hours per year

Greenville-Spartanburg

Zip Code	Home	Work	Other	Total
29301	412	201	173	786
29303	89	288	64	441
29306	121	103	116	340
29316	210	33	21	264
29365	118	19	11	148
29369	209	22	18	249
29377	6	1	1	7
29601	207	400	315	921
29605	478	540	111	1,128
29607	643	561	624	1,828
29609	604	211	167	983
29611	130	127	36	293
29615	870	495	219	1,584
29617	273	57	28	357
29642	311	72	30	413
29650	758	167	93	1,018
29651	621	284	84	989
29662	172	60	28	260
29680	322	28	42	392
29681	921	216	90	1,227
29687	521	87	315	923
Total	7,995	3,972	2,585	14,551

Columbia

Zip Code	Home	Work	Other	Total
29033	118	53	9	180
29063	562	45	30	637
29072	851	209	68	1,128
29073	270	25	15	309

29169	434	193	35	662
29170	221	65	22	308
29201	316	1,147	409	1,873
29203	160	268	41	469
29204	291	280	75	646
29205	788	180	181	1,148
29206	496	123	61	680
29209	523	139	91	753
29210	425	615	333	1,373
29212	703	132	281	1,117
29223	650	259	100	1,009
29229	568	18	37	622
Total	7,374	3,751	1,788	12,914

Charleston

Zip Code	Home	Work	Other	Total
29401	397	381	212	989
29403	315	353	135	802
29405	132	331	59	521
29406	263	384	253	900
29407	611	264	163	1,038
29412	859	89	73	1,021
29414	633	67	41	741
29418	156	171	161	488
29420	113	27	9	148
29439	100	3	5	108
29445	519	100	33	653
29451	206	15	12	232
29456	188	21	10	218
29464	1,209	301	230	1,740
29466	713	30	39	782
29482	132	5	6	143
29485	533	43	31	608
Total	7,078	2,584	1,472	11,134

Athens

Zip Code	Home	Work	Other	Total
30601	201	320	147	668
30605	890	305	122	1,317
30606	1,074	291	291	1,656
30607	224	88	21	332
30622	277	93	28	398
Total	2,665	1,097	610	4,372

Atlanta

Zip Code	Home	Work	Other	Total
30002	283	5	37	326
30004	859	1,004	310	2,173
30005	498	428	216	1,142
30008	102	41	21	164
30011	51	7	8	67
30012	132	86	33	251
30013	147	67	31	245
30016	214	19	31	264
30017	289	13	39	341
30019	577	44	82	704
30021	127	7	18	152
30022	1,090	269	201	1,560
30024	974	299	180	1,452
30030	1,792	236	274	2,302
30032	235	52	40	327
30033	1,283	197	201	1,681
30034	120	31	21	173
30035	30	87	20	136
30038	139	4	118	261
30039	309	22	44	375
30040	627	267	129	1,024
30041	844	186	143	1,172
30043	868	196	148	1,212
30044	627	233	123	983
30045	201	270	75	546
30047	848	145	136	1,129
30052	409	37	59	505
30058	90	71	31	193
30060	278	514	177	969
30062	1,275	253	210	1,739

30064	807	111	151	1,068
30066	816	210	143	1,169
30067	496	604	190	1,289
30068	986	102	171	1,259
30071	200	565	477	1,242
30072	48	1	6	55
30075	1,152	157	1,086	2,395
30076	905	499	215	1,619
30078	436	66	68	569
30079	48	13	9	70
30080	616	611	202	1,429
30082	386	69	62	517
30083	231	104	277	612
30084	569	303	138	1,010
30087	510	92	110	712
30088	109	13	16	138
30092	538	311	126	975
30093	224	212	129	564
30094	257	54	43	354
30096	751	453	212	1,416
30097	730	119	704	1,553
30101	533	68	81	683
30102	376	100	67	542
30106	90	41	58	189
30115	614	88	95	797
30122	66	46	17	128
30126	289	39	44	372
30127	452	42	66	560
30134	123	63	27	213
30135	414	67	65	546
30141	117	11	17	145
30144	597	421	199	1,217
30152	464	48	99	611
30157	238	9	32	279
30168	84	41	104	229
30188	679	155	131	965
30189	492	70	467	1,029
30214	385	115	71	570
30215	491	45	71	607
30228	141	34	24	199
30236	248	103	51	402
30238	61	23	12	96
30250	6	1	1	8

30253	330	77	57	464
30260	127	75	30	232
30265	419	77	68	564
30269	842	172	140	1,153
30273	31	4	5	40
30274	30	43	12	85
30281	390	88	383	862
30290	192	20	28	240
30291	36	33	11	79
30294	48	55	72	175
30296	36	15	7	58
30297	42	98	23	164
30303	122	1,319	488	1,929
30305	864	891	283	2,037
30306	1,449	111	223	1,784
30307	1,565	211	368	2,144
30308	500	905	1,166	2,572
30309	1,103	982	503	2,588
30310	89	106	162	357
30311	126	25	22	173
30312	417	302	597	1,316
30313	71	424	169	664
30314	19	18	6	43
30315	127	43	141	310
30316	702	104	126	932
30317	297	38	120	455
30318	493	715	194	1,402
30319	1,083	351	238	1,672
30322	19	27	39	85
30324	699	501	197	1,397
30326	128	105	36	268
30327	877	343	181	1,401
30328	924	823	395	2,143
30329	557	167	102	826
30331	133	281	115	529
30337	667	312	754	1,732
30338	852	547	209	1,608
30339	423	556	173	1,152
30340	326	579	751	1,656
30341	465	597	182	1,244
30342	748	644	225	1,616
30344	126	102	63	291
30345	760	190	133	1,083

30346	127	70	53	250
30349	180	186	57	423
30350	593	164	120	877
30354	18	371	72	461
30360	224	105	48	376
30501	199	312	83	594
30504	159	97	38	294
30518	460	157	88	704
30519	389	50	59	499
30542	353	49	54	457
30548	265	11	36	312
30566	65	55	18	138
30620	89	2	12	103
Total	55,470	26,127	19,372	100,970

Augusta

Zip Code	Home	Work	Other	Total
29828	12	1	1	15
29834	6	1	0	7
29841	500	70	30	600
30809	660	68	49	776
30813	213	25	13	250
30901	95	790	177	1,063
30904	196	159	74	429
30905	19	4	2	25
30906	107	250	203	560
30907	695	137	61	893
30909	341	138	66	546
Total	2,845	1,642	675	5,163

Macon

Zip Code	Home	Work	Other	Total
31005	211	11	20	241
31028	79	3	17	98
31088	594	98	94	786
31093	231	94	34	358
31201	64	243	141	448
31204	211	78	30	320
31206	45	104	167	316
31210	431	99	122	651
Total	1,864	730	625	3,219

Savannah

Zip Code	Home	Work	Other	Total
31322	265	14	9	287
31328	136	10	5	150
31401	277	207	220	704
31404	154	106	71	330
31405	439	170	30	639
31406	407	159	43	609
31410	384	19	24	427
31411	375	21	18	414
31415	6	11	1	18
31419	409	59	20	488
Total	2,851	775	441	4,067

Birmingham

Zip Code	Home	Work	Other	Total
35007	300	63	26	389
35020	67	162	14	243
35068	37	7	5	49
35114	100	3	5	107
35124	338	134	34	506
35127	43	2	2	48
35203	37	337	108	483
35204	25	45	9	80
35205	396	208	45	650
35206	43	14	17	74
35208	18	8	13	40
35209	377	341	76	794
35210	251	107	84	442
35211	25	64	28	116
35212	49	27	29	105
35213	377	66	85	528
35214	31	23	3	57
35215	141	36	9	186
35216	605	215	214	1,035
35217	49	76	7	132
35218	24	11	2	37
35221	6	5	1	12
35222	241	162	33	436
35223	345	59	176	580
35226	690	117	80	888

35228	6	7	1	13
35233	37	257	33	328
35234	0	66	4	70
35235	160	57	11	228
35242	898	217	91	1,206
35243	382	132	159	674
35244	595	178	175	948
Total	6,693	3,209	1,581	11,484

Huntsville

Zip Code	Home	Work	Other	Total
35741	161	13	3	177
35749	339	14	5	359
35757	217	14	4	235
35758	1,044	330	88	1,462
35763	367	15	20	402
35801	669	492	461	1,622
35802	412	151	20	582
35803	621	89	44	754
35805	37	299	187	523
35806	349	494	158	1,001
35810	112	39	47	198
35811	404	170	56	630
35816	50	132	35	217
35824	161	122	30	314
Total	4,944	2,373	1,158	8,475

Mobile

Zip Code	Home	Work	Other	Total
36511	40	1	3	44
36526	687	125	90	902
36527	303	47	113	463
36532	639	156	55	850
36559	33	8	3	44
36561	229	37	21	288
36564	19	0	1	21
36602	19	185	113	316
36603	13	154	91	257
36604	201	87	91	379
36605	143	79	16	238
36606	175	204	221	599

36607	50	139	15	204
36608	437	244	66	747
36609	175	121	61	357
36610	13	77	8	98
36611	12	11	2	25
36612	6	8	1	15
36617	6	52	5	63
36618	87	22	8	117
36619	194	32	15	241
36693	175	94	81	350
36695	653	30	349	1,033
Total	3,655	1,881	1,080	6,616

Montgomery

Zip Code	Home	Work	Other	Total
36054	80	13	5	97
36066	121	23	8	153
36104	43	265	122	430
36106	234	90	40	364
36107	43	15	14	72
36109	234	89	23	345
36111	105	50	26	181
36113	6	0	0	7
36116	172	46	30	247
36117	412	140	59	611
Total	1,450	731	326	2,508

Section 3.5.1 – Charging Locations in the Tri-State Region (October 2012)

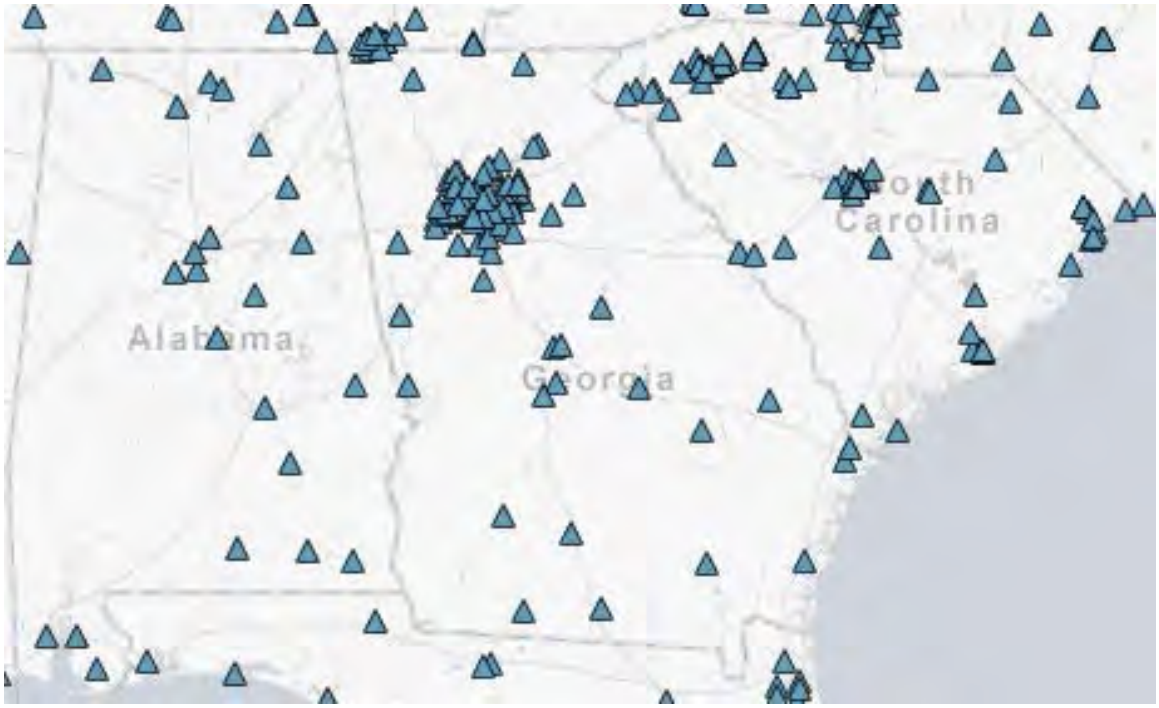


Figure 1. Map showing charging locations in the Southeast (each triangle represents one charger).[1]

Current Charging Station Availability in the Southeast

As of October 2012, the Alternative Fuels and Advanced Vehicle Data Center reported that there were 44 publically available charging stations in the state of Alabama, 166 in the state of Georgia, and 200 in the state of South Carolina, totaling 410 electric vehicle charging stations in the tri-state region.

The Alternative Fuels Data Center obtains information about new stations from trade media, Clean Cities coordinators, a form on the AFDC website, and through collaborating with infrastructure equipment and fuel providers. Currently, EVSE data is updated twice a month. Additional details are provided to indicate the number of stations (Posts), and the number and type of charging outlets at each site. A station locator can be found at AFDC's Alternative Fueling Station Locator:

http://www.afdc.energy.gov/locator/stations/

[1] U.S. DOE Alternative Fuels Data Center, *"Alternative Fueling Station Locator."* Accessed October 18, 2012. http://www.afdc.energy.gov/locator/stations/

Section 3.4.7 – EV Readiness in the Southeast - Incentives

Federal Incentives

I. Incentive: Up to $7,500 income tax credit

a. *Details:* The federal government provides a tax incentive towards the purchase of a new electric vehicle. This financial incentive takes the form of a tax credit, going towards the purchaser's tax bill for the year of purchase.

b. Instructions: The credit is computed and claimed on Federal Form 8936.
   1. Visit *http://fueleconomy.gov/feg/taxcenter.shtml* to confirm that you qualify
   2. Download and complete the IRS "Qualified Plug-In Electric Motor Vehicle Credit" Form (IRS Form 8936) at *http://www.irs.gov/pub/irs-access/f8936_accessible.pdf*
   3. Submit the Federal Form 8936 along with your tax filing

c. Important Stipulations:
   1. The Federal tax incentives only apply to purchasers of new electric vehicles. Pre-owned or leased vehicles do not apply. (Some leasing arrangements might provide credit towards the down payment.)
   2. The full balance of the tax credit must be put towards the current year's income tax; any remainder of the $7,500 is otherwise forfeit, and will not be transferred to the following year.
   3. The vehicle must be used primarily in the United States.
   4. Plug-in hybrids and battery-electric vehicles must be equipped with battery packs rated for at least 4 kilowatt-hours or greater, and must be capable of being charged from an external source.

Example completed Federal Form 8936

Form **8936** — Department of the Treasury, Internal Revenue Service

Qualified Plug-In Electric Drive Motor Vehicle Credit

▶ Attach to your tax return.

OMB No. 1545-2137

2010

Attachment Sequence No. 125

Name(s) shown on return: **John R Smith**

Identifying number:

Note.

- Use this form to claim the credit for certain plug-in electric vehicles (other than two- or three-wheeled or low-speed four-wheeled vehicles).
- Claim the credit for certain two- or three-wheeled or low-speed four-wheeled plug-in electric vehicles on Form 8834.
- Claim the credit for certain alternative motor vehicles or plug-in electric vehicle conversions on Form 8910.

Part I Tentative Credit

Use a separate column for each vehicle. If you need more columns, use additional Forms 8936 and include the totals on lines 6 and 10.		(a) Vehicle 1	(b) Vehicle 2	(c) Vehicle 3
1 Year, make, and model of vehicle	1	2012 Chevrolet Vo		
2 Enter date vehicle was placed in service (MM/DD/YYYY)	2	01 / 01 / 2012	/ /	/ /
3 **Tentative credit** (see instructions for amount to enter)	3	7,500		

Next: If you did NOT use your vehicle for business or investment purposes and did not have a credit from a partnership or S corporation, skip Part II and go to Part III. All others, go to Part II.

Part II Credit for Business/Investment Use Part of Vehicle

4 Business/investment use (percentage (see instructions)	4	0 %	%		%	
5 Multiply line 3 by line 4	5	0				
6 Add columns (a) through (c) on line 5				6	0	
7 Qualified plug-in electric drive motor vehicle credit from partnerships and S corporations				7	0	
8 **Business/investment use part of credit.** Add lines 6 and 7. Partnerships and S corporations, report this amount on Schedule K; all others, report this amount on Form 3800, line 1y				8	0	

Part III Credit for Personal Use Part of Vehicle

9 If you skipped Part II, enter the amount from line 3. If you completed Part II, subtract line 5 from line 3	9	7,500				
10 Add columns (a) through (c) on line 9				10	7,500	
11 Enter the amount from Form 1040, line 46, or Form 1040NR, line 44				11	14,500	
12 Personal credits from Form 1040 or 1040NR (see instructions)				12	5	
13 Subtract line 12 from line 11				13	14,495	
14 **Personal use part of credit.** Enter the **smaller** of line 10 or line 13 here and on Form 1040, line 53, or Form 1040NR, line 50. Check box **c** on that line and enter "8936" in the space next to that box. If line 13 is smaller than line 10, see instructions				14	7,500	

For Paperwork Reduction Act Notice, see instructions. Cat. No. 37751E Form **8936** (2010)

Georgia Incentives

I. Tax Incentives:

a. Incentive: Up to $5000 Zero Emission Vehicle (ZEV) income tax credit

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

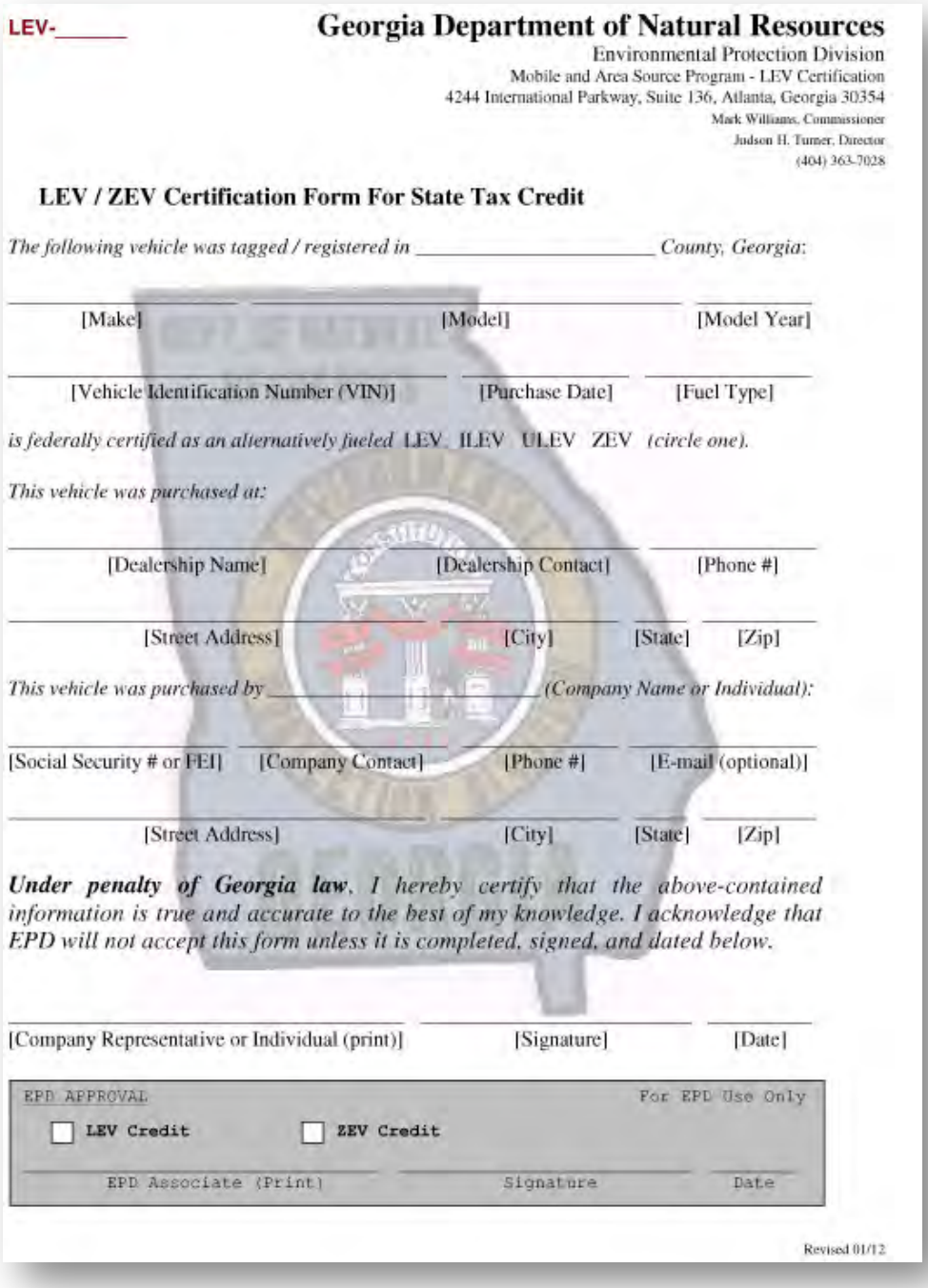
ii. *Instructions:* The Georgia Environmental Protection Division (EPD) is responsible for issuing certificates for qualified vehicles. The certificate is used as verification that the taxpayer purchased/leased a qualified ZEV. The certificates are to be sent in with the taxpayer's income tax return in order to qualify for the tax credits. The State of Georgia Department of Revenue is responsible for approving and issuing the tax credit.

- Obtain LEV/ZEV Certification Form from your dealer or EPD.
- Complete the Certification Form and send the original to EPD along with copies of the following documents to EPD: (a) Bill of sale in the name of the taxpayer claiming the credit and (b) tag receipt or (c) Manufacturer Statement/Certificate of Origin. The form(s) and documents should be sent to the attention of James Udi, Georgia Environmental Protection Division, 4244 International Pkwy., Suite 134, Atlanta, Georgia 30354
- EPD will review the completed form and documents. If all of the requirements have been met, EPD will sign the form and send it back to the taxpayer.
- The taxpayer should attach the original approved Certification Form(s) to their Georgia Income Tax Return (Form 500) or Georgia Amended Tax Return (Form 500 X). Schedule 2 of the 500 form should reflect the amount of the anticipated credit (not to exceed your current year's tax liability). **Omission of the original Certificate Form(s) will result in the credit claimed being disallowed.**

iii. Important Stipulations:

- In no event shall the amount of this tax credit exceed the taxpayer's income tax liability. This tax credit may be carried forward for five years from the close of the taxable year in which the vehicle was purchased.
- Hybrid-electric vehicles do not qualify for this incentive program. This includes Plug-in Hybrid Electric Vehicles (PHEV's) such as the Chevrolet Volt.
- Low-speed vehicles do not qualify for this credit.

Georgia EPD LEV / ZEV Certificate Form



LEV-_____

Georgia Department of Natural Resources

Environmental Protection Division
Mobile and Area Source Program - LEV Certification
4244 International Parkway, Suite 136, Atlanta, Georgia 30354
Mark Williams, Commissioner
Judson H. Turner, Director
(404) 363-7028

LEV / ZEV Certification Form For State Tax Credit

The following vehicle was tagged / registered in _____ *County, Georgia*:

[Make] [Model] [Model Year]

[Vehicle Identification Number (VIN)] [Purchase Date] [Fuel Type]

is federally certified as an alternatively fueled LEV ILEV ULEV ZEV *(circle one).*

This vehicle was purchased at:

[Dealership Name] [Dealership Contact] [Phone #]

[Street Address] [City] [State] [Zip]

This vehicle was purchased by _____ *(Company Name or Individual):*

[Social Security # or FEI] [Company Contact] [Phone #] [E-mail (optional)]

[Street Address] [City] [State] [Zip]

***Under penalty of Georgia law**, I hereby certify that the above-contained information is true and accurate to the best of my knowledge. I acknowledge that EPD will not accept this form unless it is completed, signed, and dated below.*

[Company Representative or Individual (print)] [Signature] [Date]

EPD APPROVAL For EPD Use Only

☐ LEV Credit ☐ ZEV Credit

EPD Associate (Print) Signature Date

Revised 01/12

b. Incentive: Up to $2,500 Alternative Fuel Low Emission Vehicle (LEV) income tax credit

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

ii. *Instructions:* The Georgia Environmental Protection Division (EPD) is responsible for issuing certificates for qualified vehicles and conversions. **Detailed instructions are provided under the "Georgia Zero Emission Vehicle (ZEV) Income Tax Credit" section.**

iii. *Important Stipulations:*

- Vehicles that have been converted need to include a copy of the certificate of conformity from the manufacturer stating that the conversion will allow the vehicle to meet minimum LEV standards.
- The Georgia Department of Natural Resources, Environmental Protection Division us the same form for both Zero Emission Vehicles (ZEV) and Alternative Fuel Low Emission Vehicles (LEV).
- In no event shall the amount of this tax credit exceed the taxpayer's income tax liability. This tax credit may be carried forward for five years from the close of the taxable year in which the vehicle was purchased or converted.
- Hybrid-electric vehicles do not qualify for this incentive program. This includes Plug-in Hybrid Electric Vehicles (PHEV's) such as the Chevrolet Volt.
- Vehicles that qualify for the LEV tax credit typically include vehicles solely powered by natural gas or propane. Systems that convert a gasoline or diesel vehicle to an alternative fuel must be certified by the manufacturer to allow the vehicle to meet at a minimum low emission vehicle standards and the gasoline/diesel fuel system must be disabled or completely removed from the vehicle.

c. Incentive: Up to $2,500 Electric Vehicle Supply Equipment (EVSE) Tax Credit

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

ii. *Instructions:* The Georgia Environmental Protection Division (EPD) is responsible for issuing certificates for qualified chargers. The certificate is used as verification that the taxpayer purchased and installed a qualified electric vehicle charger. The certificates are to be sent in with the taxpayer's income tax return in order to qualify for the tax credits. The Department of Revenue is responsible for approving and issuing the tax credit.

1. Obtain Electric Vehicle Charger Certification Form from your EVSE dealer or EPD.

2. Complete the Certification Form and send the original to EPD along with a copy of the bill of sale in the name of the taxpayer claiming the credit. The form and document should be sent to the attention of James Udi, Georgia Environmental Protection Division, 4244 International Pkwy., Suite 134, Atlanta, Georgia 30354
3. EPD will review the completed form and document. If all of the requirements have been met, EPD will sign the form and send it back to the taxpayer.
4. The taxpayer should attach the original approved Certification Form(s) to their Georgia Income Tax Return (Form 500) or Georgia Amended Tax Return (Form 500 X). Schedule 2 of the 500 form should reflect the amount of the anticipated credit (not to exceed your current year's tax liability). **Omission of the original Certificate Form(s) will result in the credit claimed being disallowed.**

iii. Important Stipulations:

- Tax credits are allowed only for **non-retail** business enterprises.
- The charger must be rated greater than 130 volts and must be designed to charge on-road vehicles.
- The charger must be located for and allowed public access.

Georgia EPD Electric Vehicle Charger Certificate Form

EVC-_____

Georgia Department of Natural Resources

Environmental Protection Division
Mobile and Area Source Program - LEV Certification
4244 International Parkway, Suite 136, Atlanta, Georgia 30354
Mark Williams, Commissioner
Judson H. Turner, Director
(404) 363-7028

Electric Vehicle Charger (EVC) Certification Form For State Tax Credit

The following electric vehicle charger:

[Manufacturer] [Model]

[Serial Number] [Seller (Company Name)]

was installed at the following location:

[Date Installed] [Installation Location] [Phone # At Location]

[Address] [City] [State] [Zip]

[Installed by (Company)] [Company Contact] [Phone #]

and was purchased by _____ (Company Name):

[Company Contact] [Total Cost] [Phone #] [E-mail (optional)]

[Address] [City] [State] [Zip]

***Under penalty of Georgia law**, I hereby certify that the above-contained information is true and accurate to the best of my knowledge. I acknowledge that EPD will not accept this form unless it is completed, signed, and dated below.*

[Company Representative (print)] [Signature] [Date]

EPD APPROVAL For EPD Use Only

EPD Associate (Print) Signature Date

Revised 01/12

Miscellaneous Incentives:

a. Incentive: State of Georgia Alternative Fuel Vehicle License Plate and HOV Lane Access

i. *Details:* The State of Georgia offers a special license plate for alternative fuel vehicles, which allows access to the designated HOV lanes. Any vehicle that has been certified by the EPA in accordance with the Federal Clean Air Act may apply for the Georgia AFV License Plate.

ii. *Instructions:* If you are purchasing a PHEV (such as the Chevy Volt), you must ensure that the car is registered properly by the auto dealer with the correct fuel code distinction ('O' for 'Other' or 'F' for 'Flex'), which will allow the car to qualify for the AFV License Plate. (Note that the default electric/gas designator is type 'B' which does not allow for issuance of the AFV Plate.)

1. Print and complete the "Application and Verification for Issuance of an Alternative Fuel License Plate" form from the Georgia Department of Revenue website (http://motor.etax.dor.ga.gov/forms/pdf/motor/MV_Application_Verification_Alternative_Fuel_License_Form_AFV.pdf).
2. Apply at any Georgia Department of Revenue County Tag Office. Note that certain costs are associated with the AFV License Plate, in addition to the standard annual registration fee. This includes a one-time Manufacturing Fee, and the Annual Special Tag Fee. If you prepaid the manufacturing fee please include your original receipt showing payment to avoid being charged twice.

iii. Important Stipulations:

- Plug-In Hybrid Electric Vehicles (PHEVs) such as the Chevy Volt must be registered properly by the auto dealer with the correct fuel code distinction ('O' or 'F'). This fuel code cannot easily be changed after the vehicle's VIN is registered.
- The Official Code of Georgia Annotated (O.C.G.A.) 40-2-76 defines an Alternate Fuel Vehicle for the purposes of the AFV License Plate as a vehicle that has been certified by the EPA in accordance with the Federal Clean Air Act. If you are unsure if your vehicle qualifies, you can verify eligibility with the Georgia Dept. of Natural Resources, Environmental Protection Division at 404-363-7028.
- The owner must operate the vehicle on electric power not less than 85% of the total time the vehicle is in operation per year.

Georgia AFV Tag Application

Application and Verification for Issuance of an Alternative Fuel License Plate

Applicant's Full Legal Name:		
Applicant's Residence Address Including City, State & Zip Code:		County of Residence:
Daytime Telephone Number Including Area Code:	Owner's Driver's License Number:	
Make and Model of Vehicle	Year	Vehicle Identification Number (V.I.N.)

An Alternative Fueled vehicle is any vehicle fueled by an alternative fuel, as described in O.C.G.A. §40-2-76 (a)(2)(A) or (B).

Please check below the alternative fuel license type & location where you intend to purchase such fuel.

- ❒ Compressed Natural Gas (CNG) or Propane (LPG)
- ❒ Ethanol (E85)
- ❒ Electricity or Solar Energy

Brand of Fuel (except Electricity or Solar Energy):

Fuel will primarily be purchased in:

City	County

Applicants Verification of Information Provided

By signing this application, you are affirming that you:

1. Own and operate an approved alternative fuel vehicle
2. Will purchase approved alternative fuel primarily at the location indicated on this application
3. Will operate this vehicle on the alternative fuel checked above not less than 85% of the total time the vehicle is in operation.

By signing this application you are affirming, under penalties of false swearing, that the statement and answers made by you are true and correct, and that if there are any change in the facts represented on this application you shall immediately surrender the license plate to your county tag office or your registration shall be revoked.

Applicant's Signature:	Date:

Revision 07/08
MV-AFV application

Page 1 of 2

b. *Incentive: Alternative Fuel Vehicle (AFV) High Occupancy Toll (HOT) Lane Exemption*

i. *Details:* Alternative fuel vehicles displaying the proper AFV license plate may use HOV lanes, regardless of the number of passengers. Alternative fuel vehicles displaying the proper alternative fuel license plate may also obtain a Peach Pass for toll exempt access on all Peach Pass controlled High Occupancy Toll (HOT) lanes.

ii. *Instructions:* **Car owner must apply for the State of Georgia AFV-specific License Plate, detailed instructions are provided under the "State of Georgia Alternative Fuel Vehicle License Plate" section.**

There are 2 different **Peach Pass** options available: a "***Toll Exempt Account***" or a "***Personal Toll Account***." The ***Toll Exempt*** account only exempts an AFV from the high occupancy restrictions on HOT lanes such as I-85 and does not exempt the AFV from paying tolls on roads without HOV requirements (e.g., GA 400). To use the **Peach Pass** on HOT lanes without paying a toll and still be able to use the **Peach Pass** to pay the toll on other roads, a ***Personal Toll Account*** must be set up.

The **Peach Pass** transponder is free but does require a minimum prepaid amount of $20.00 for tolls. You must maintain sufficient funds in your Account to cover tolls and other charges resulting from your use of the Peach Pass.

Detailed instructions on obtaining a **Peach Pass** are available on-line at http://www.peachpass.com/.

After an account is established, customers will receive a **Peach Pass** transponder in the mail along with instructions for mounting the Peach Pass on their vehicle.

Once you have set up your ***Personal Toll Account*** and received your transponder, you must change the default mode of the **Peach Pass** to **Non-Toll** and set the duration for this change to **Indefinite**. This can be done on-line at the http://www.peachpass.com/ web site under the "*Manage My Account*" option. A **Peach Pass** set up in this way will allow the AFV to use the HOT lane toll free and still automatically deduct the toll on GA-400.

iii. Important Stipulations:

- Car must display the appropriate AFV license plate
- Do not travel in the I-75 / I-85 HOV / HOT lanes until *both* the **Peach Pass** and the permanent AFV license plate have been received and properly applied to the vehicle. A temporary AFV certificate is not acceptable.
- Do not forget to set the mode to **Non-Toll** and the duration to **Indefinite**.

c. Incentive: Plug-In Electric Vehicle Charging Rate Incentive - Georgia Power

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

ii. *Instructions:* Application must be completed on the Georgia Power website.

1. Visit the Georgia Power website, and complete the given form at: http://www.georgiapower.com/electricvehicles/plugin_application.asp
2. You will be required to submit your account holder's name and account number, as well as your address and vehicle type.

iii. Important Stipulations:

- This rate is available to residential customers only.
- This rate program for electric vehicles is purely voluntary, and must be applied for.
- Participation in this program requires a 12-month commitment.

South Carolina Incentives

I. *Incentive: Up to $2000 Plug-in Hybrid income tax credit*

a. *Details:* The State of South Carolina offers an income tax credit for plug-in hybrid vehicles equal to six hundred sixty-seven dollars, plus one hundred eleven dollars if the vehicle has at least five-kilowatt hours of battery capacity, plus an additional one hundred eleven dollars for each kilowatt-hour of battery capacity in excess of five-kilowatt hours. The maximum credit allowed by this section is two thousand dollars.
   i. A plug-in hybrid vehicle is a vehicle that:
   (1) Shares the same benefits as an internal combustion and electric engine with an all-electric range of no less than nine miles;
   (2) Has four or more wheels;
   (3) Draws propulsion using a traction battery;
   (4) Has at least four kilowatt hours of battery capacity; and
   (5) Uses an external source of energy to recharge the battery.

b. Instructions: To claim the credit, the taxpayer must provide the South Carolina Department of Revenue with a certification from the vehicle manufacturer, or in the case of a foreign vehicle manufacturer, its domestic distributor, stating that the vehicle is a qualified plug-in hybrid as described above, and providing the vehicle's number of kilowatt hours of battery capacity.

Each individual's dealer is responsible for issuing certificates for qualified vehicles. The certificate is used as verification that the taxpayer purchased/leased a qualified plug-in hybrid vehicle. The certificates are to be sent in with the taxpayer's income tax return in order to qualify for the tax credits. The State of South Carolina Department of Revenue is responsible for approving and issuing the tax credit.

- Obtain certification from your dealer.
- Complete the Plug-in Hybrid Vehicle Credit Tax Form (TC 48).
- Complete the Tax Credits Schedule Form (SC1040 TC) for the credit you are claiming.
- The taxpayer should attach the certification form from the dealer, the Plug-in Hybrid Vehicle Credit Tax Form (TC 48), and the Tax Credits Schedule Form (SC1040 TC) to their Income Tax Return (SC 1040). **Credits may be disallowed if necessary schedules are not attached to your return.**

**Please note that these directions may change with the renewal of the incentive in May 2012*

Alabama Incentives

I. *Incentive: Plug-In Electric Vehicle Charging Rate Incentive - Alabama Power*

a. *Details*: Alabama Power offers a Business Electric Vehicle Time of Use (BEVT) rate for electricity purchased to charge PEVs used for non-residential purposes. The electricity used for vehicle charging is metered separately from all other electricity use.

*Please see sample form below

RATE BEVT
BUSINESS ELECTRIC VEHICLE - TIME-OF-USE

By order of the Alabama Public Service Commission dated October 3, 2000 in Informal Docket # U-4226.

The kWh charges shown reflect adjustment pursuant to Rates RSE and CNP for application to monthly bills effective for April 2011 billings.

PAGE	EFFECTIVE DATE	REVISION
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AVAILABILITY

Available in all areas served from the interconnected system of the Company.

APPLICABILITY

Applicable for service in which charging the batteries of electric vehicles is necessary for non-residential customer use. The load will be separately metered from all other electrical load and used for the exclusive purpose of charging electric vehicle batteries. Service shall not be resold or shared with others.

CHARACTER OF SERVICE

Single or three phase service directly from the Company's 44 kV or higher transmission system (transmission) or distribution lines (primary). Single or three phase service at the secondary voltage of transformation facilities supplied from the Company's transmission system (primary) or distribution system (secondary).

MONTHLY RATE (SECONDARY)

Base Charge:
$100 per customer; plus

Charge for Energy:

JUNE 1 through SEPTEMBER 30	OCTOBER 1 through MAY 31
17.8246¢ per kWh (on-peak)	
7.3146¢ per kWh (intermediate period)	7.3146¢ per kWh (intermediate period)
4.5246¢ per kWh (off-peak)	4.5246¢ per kWh (off-peak)

DEFINITION OF TIME-OF-USE PERIODS

The on-peak period for June 1 through September 30 is defined as being those hours between 12:00 noon and 7:00 p.m., Monday through Friday. The intermediate period is defined as being those hours between 10:00 a.m. to 12:00 noon and between 7:00 p.m. to 9:00 p.m., Monday through Friday. All other hours are off-peak.

The intermediate period for October 1 through May 31 is defined as being those hours between 7:00 a.m. and 9:00 p.m., Monday through Friday. All other hours are off-peak.

RATE BEVT
BUSINESS ELECTRIC VEHICLE - TIME-OF-USE

By order of the Alabama Public Service Commission dated October 3, 2000 in Informal Docket # U-4226.

The kWh charges shown reflect adjustment pursuant to Rates RSE and CNP for application to monthly bills effective for April 2011 billings.

PAGE	EFFECTIVE DATE	REVISION
2 of 3	January, 2006 Billings	Fourth

For the purposes of this rate, the following holidays are considered off-peak: New Year's Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. When any of the foregoing holidays fall on Sunday, the Monday following shall be considered off-peak.

DETERMINATION OF BILLING CAPACITY

The monthly kW capacity shall be the measured maximum integrated fifteen (15) minute capacity during each billing period of approximately thirty (30) days measured in kW.

ADJUSTMENT FOR TRANSFORMATION FACILITIES

The monthly charges shall be reduced by fifty-four cents (54¢) per kW of billing capacity whenever the Consumer furnishes all required transformation facilities supplied from distribution lines. The monthly charges shall be reduced by one dollar and thirty cents ($1.30) per kW of billing capacity whenever the Consumer furnishes all required transformation facilities supplied from transmission lines.

MINIMUM BILL

No monthly bill will be rendered for less than the Base Charge, plus $2.00 times the monthly kW capacity, less applicable adjustments for transformation facilities, plus applicable provisions of Rate ECR (Energy Cost Recovery) and Rate T (Tax Adjustment).

PAYMENT

Bills for service rendered hereunder are payable within ten (10) days from the due date and if not paid within such period become delinquent and subject to charges as set forth in the Company's Rules and Regulations.

TERM OF CONTRACT

Service under this rate shall be for a minimum period of five (5) years. Service shall continue beyond the minimum period unless and until terminated by at least one (1) year's written notice by either party.

RATE BEVT
BUSINESS ELECTRIC VEHICLE - TIME-OF-USE

By order of the Alabama Public Service Commission dated October 3, 2000 in Informal Docket # U-4226.

The kWh charges shown reflect adjustment pursuant to Rates RSE and CNP for application to monthly bills effective for April 2011 billings.

PAGE	EFFECTIVE DATE	REVISION
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ENERGY COST RECOVERY

The amount calculated at the above rate will be increased under the provisions of the Company's Rate ECR (Energy Cost Recovery) by applying the effective Energy Cost Recovery Factor.

RATE STABILIZATION AND EQUALIZATION

Rate RSE (Rate Stabilization and Equalization Factor) is incorporated in this rate and will be applied to adjust (increase or decrease) kWh charges calculated hereunder.

ADJUSTMENT FOR COMMERCIAL OPERATION OF CERTIFICATED NEW PLANT

Rate CNP (Adjustment for Commercial Operation of Certificated New Plant) is incorporated in this rate and will be applied to increase kWh charges calculated hereunder.

NATURAL DISASTER RESERVE

The amount calculated at the above rate will be increased under the provisions of the Company's Rate Rider NDR (Natural Disaster Reserve) by applying the effective NDR Charge.

GENERAL

The amount calculated at the above rate is subject to possible tax adjustments as set forth in Rate T and to rules and regulations approved or prescribed by the Alabama Public Service Commission, including any Special Rules and Regulations governing the application of this rate.

State Incentives: Best Practices in the United States

Visit the Alternative Fuels Data Center web site for information on laws and incentives throughout the United States:

http://www.afdc.energy.gov/laws

Oregon

I. Incentive: Business Tax Credits

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

III. Point of Contact: Bob Repine, Director, Oregon Department of Energy
   Email: bob.repine@odoe.state.or.us

Nebraska

I. Incentive: Dollar and Energy Savings Loan Program

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

*Please see sample form below

Dollar and Energy Saving Loans
Southeast Regional EV Readiness Workbook

Dedicated Alternate Fuel Vehicle and/or Alternate Fueling Facility Projects Application

FORM 7

APPLICANT INFORMATION

Name

Mailing Address

INSTRUCTIONS

Dedicated alternate fuel projects may be financed under this program in four ways:

- Replacement of traditional-fuel with dedicated alternate fuel vehicles (complete parts 1 & 2)
- Purchase of new dedicated alternate-fuel vehicles (complete part 2)
- Conversion of traditional-fuel vehicles to operate solely on an alternate fuel (complete parts 1 & 3)
- Establishment of an dedicated alternate fueling facility or purchase of dedicated alternate fueling equipment (complete part 4)

Alternate fuel means ethanol, methanol, electricity, compressed natural gas, liquefied natural gas, propane, and any other alternate fuel recognized by the United States Department of Energy. Dedicated means vehicle cannot operate on gasoline or diesel fuel.

WHO MAY APPLY. Only legal residents of Nebraska may apply for loans. A legal resident is a Nebraska taxpayer, a Nebraska partnership, a Nebraska-chartered corporation, a subdivision of Nebraska government (except public school districts) or a person who has maintained a permanent residence and lived in the state for more than six months. Residency requirements may differ for ENERGY STAR® business or non-profit partners.

GETTING BIDS. You need to get bids or quotes first, so you will have them available for your lender.

TERMS. Maximum loan terms are: three years for conversion equipment, five years for new dedicated alternate fuel vehicles under 8,500 lbs. gross vehicle weight, seven years for new dedicated alternate fuel vehicles 8,500 lbs. gross vehicle weight or over, and ten years for dedicated alternate fuel stations and equipment. Minimum monthly payments apply.

WHERE TO FILE. Take this completed form and the accompanying bids or quotes to your local lender for loan processing. If the lender of your choice is not participating in this program, contact the Nebraska Energy Office to receive the name of a participating lender.

FOR INFORMATION. Contact the Nebraska Energy Office, P.O. Box 95085, Lincoln, NE 68509-5085, Phone: (402) 471-2867, Fax: (402) 471-3064, Email: energy@nebraska.gov
Loan Program: http://www.neo.ne.gov/loan/index.html

PART 1. EXISTING VEHICLES

List Number, Manufacturer, Make, Model, Fuel Type and Year of Each Existing Vehicle to be Replaced or Converted:

1. ☐

Existing Vehicle(s) will be	☐ Converted to Alternate Fuel	☐ Replaced with New Alternate Fuel Vehicle(s)	Passenger Capacity	Ownership ☐ Owned ☐ Leased

2. ☐

Existing Vehicle(s) will be	☐ Converted to Alternate Fuel	☐ Replaced with New Alternate Fuel Vehicle(s)	Passenger Capacity	Ownership ☐ Owned ☐ Leased

3. ☐

Existing Vehicle(s) will be	☐ Converted to Alternate Fuel	☐ Replaced with New Alternate Fuel Vehicle(s)	Passenger Capacity	Ownership ☐ Owned ☐ Leased

PART 2. NEW VEHICLES

List Number, Manufacturer, Make, Model, Fuel Type, and Year of Each Vehicle to be Purchased or Leased:

1. ☐

New Vehicle(s) will	☐ Replace Existing Vehicle(s) ☐ Increase Fleet Size	Expected Life	Passenger Capacity	Ownership ☐ Owned ☐ Leased	Cost per Vehicle $

2. ☐

New Vehicle(s) will	☐ Replace Existing Vehicle(s) ☐ Increase Fleet Size	Expected Life	Passenger Capacity	Ownership ☐ Owned ☐ Leased	Cost per Vehicle $

3. ☐

New Vehicle(s) will	☐ Replace Existing Vehicle(s) ☐ Increase Fleet Size	Expected Life	Passenger Capacity	Ownership ☐ Owned ☐ Leased	Cost per Vehicle $

Southeast Regional EV Readiness Workbook

FORM 7 (cont.)

PART 3. VEHICLE CONVERSIONS

1. ☐ List Number of Vehicles to be Converted and Describe Mechanical Conversion to be Performed:

Fuel Type	Expected Life	Passenger Capacity	Ownership	Conversion Cost per Vehicle $
			☐ Owned ☐ Leased	

2. ☐ List Number of Vehicles to be Converted and Describe Mechanical Conversion to be Performed:

Fuel Type	Expected Life	Passenger Capacity	Ownership	Conversion Cost per Vehicle $
			☐ Owned ☐ Leased	

3. ☐ List Number of Vehicles to be Converted and Describe Mechanical Conversion to be Performed:

Fuel Type	Expected Life	Passenger Capacity	Ownership	Conversion Cost per Vehicle $
			☐ Owned ☐ Leased	

PART 4. ALTERNATE FUELING FACILITIES

1. ☐ Describe the Current Facility, if Any:

☐ Describe the Proposed Facility and/or Equipment:

Proposed Fueling Facility Street Address or Physical Location

Alternate Fuel Type	Number of Vehicles to be Served	Estimated Life Expectancy	Estimated Cost $

2. ☐ Describe the Current Facility, if Any:

☐ Describe the Proposed Facility and/or Equipment:

Proposed Fueling Facility Street Address or Physical Location

Alternate Fuel Type	Number of Vehicles to be Served	Estimated Life Expectancy	Estimated Cost $

3. ☐ Describe the Current Facility, if Any:

☐ Describe the Proposed Facility and/or Equipment:

Proposed Fueling Facility Street Address or Physical Location

Alternate Fuel Type	Number of Vehicles to be Served	Estimated Life Expectancy	Estimated Cost $

SIGNATURE

I certify all the information supplied above is true and correct to the best of my knowledge and belief and that I will permit my lender and the Nebraska Energy Office, as they deem necessary, to have access to the subject property and records in order to make on-site inspections of the improvements or replacements I am making under the program. I also agree to respond to any follow-up survey conducted by the Nebraska Energy Office on fuel use, cost patterns and vehicle performance and that the project described above will be completed within 5 months after my lender receives a signed commitment from the Energy Office..

sign here ▶ Signature _____ Date _____

Take this completed form and bids or price quotes to your lender when you apply for your loan.

You may NOT contract for or undertake the project you propose in this application prior to the Energy Office signing a Commitment Agreement (FORM 10) with your lender to participate in the loan.

If you do so, you will lose your eligibility to finance the project with a low interest loan.

You may accept a bid, contingent on the Energy Office's signed commitment of funding, to lock in the price, but you may not proceed with the work or contractually obligate yourself to proceed until your lender notifies you that the Energy Office has signed the Commitment Agreement on your loan.

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Point of Contact: Jack Osterman, Nebraska Energy Office
Email: osterman@mail.state.ne.us

Municipal Incentives: Best Practices in the United States

Los Angeles

I. Incentive: LADWP Residential EV & Charger Installation Incentives

II. Details: Rebates worth up to $2,000 for the first one thousand Los Angeles Department of Water and Power (LADWP) customers who install electric charging station at their home.

- Time of Use Rates
  - Many utilities, including the Los Angeles Department of Water and Power and Southern California Edison, offer special rates for electricity used to charge your PEVs through “time of use” rates, which offer a financial incentive to use electricity during “off-peak” hours, when charging is most likely to happen.

III. Point of Contact: Beth Jines, Director of Sustainability City of Los Angeles
Email: Beth.Jines@lacity.org

*Please see sample form below

Los Angeles Department of Water & Power

Residential Customer Incentives & Rates

Electric Vehicle Program

LADWP RESIDENTIAL EV INCENTIVES

Residential customers in Los Angeles who are among the first to own new Plug-in Electric Vehicles (PEV) can take advantage of new lower incentive rates for electricity through the LADWP and soon will be able to participate in the LADWP EV Home Charger incentive program, which will help offset the purchase and installation costs of PEV chargers for 5,000 qualifying residential customers. LADWP's special EV rate discount is 2.5 cents/kilowatt-hour (kWh). In addition, there is a federal government tax incentive for PEVs, a state rebate, and other incentives, such as access to high occupancy vehicle lanes.

RESIDENTIAL CHARGER INSTALLATION

LADWP has partnered with other City Departments to streamline the process of providing electric service for residential home chargers. For basic installations, the process will be completed within 7 days.

We encourage any customer buying an EV to schedule a preliminary check to identify potential issues regarding the charger installation. With just one call to 1-800-DIAL DWP you will be connected to an EV program representative, who can answer questions on rates, incentives, the charger installation process, and help to schedule an assessment with field personnel.

IMPORTANT: For charger installations, a Department of Building and Safety permit is required and can be obtained by your contractor online at https://www.permitla.org. Permits for Home Charger Incentive participants will be obtained by ECOtality.

EV OFF-PEAK CHARGING DISCOUNT RATE

LADWP encourages charging of EVs during off-peak, nighttime hours and on weekends. This not only reduces strain on the grid but also maximizes the use of clean, green, wind energy, which is abundant at night. LADWP offers an off-peak charging discount of 2.5 ¢/kWh off of our base time-of-use (TOU) rate. If you're currently on our Standard rate (as most customers are), your rate goes up as you use more energy. If you choose one of our TOU rates, you will pay higher rates during the day and lower rates at night with an additional discount for EV charging at night. The basic Standard and TOU rates are as follows:

R-1: RATE A - STANDARD RESIDENTIAL RATE

Zone 1* (kWh)	Tier 1 < 350	350 < Tier 2 < 1050	Tier 3 > 1050
High Season (June-Sept)	13.2 ¢/kWh	14.7 ¢/kWh	18.1 ¢/kWh
Low Season (Oct-May)	13.2 ¢/kWh		
Zone 2* (kWh)	**Tier 1 < 500**	**500 < Tier 2 < 1500**	**Tier 3 > 1500**
High Season (June-Sept)	13.2 ¢/kWh	14.7 ¢/kWh	18.1 ¢/kWh
Low Season (Oct-May)	13.2 ¢/kWh		

R-1: RATE B - TIME-OF-USE SERVICE

	AM												PM											
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
TOU	BASE										LOW		HIGH					LOW			BASE			
High Season (June-Sept)	10.8 ¢/kWh										14.3 ¢/kWh		22.2 ¢/kWh					14.3 ¢/kWh			10.8 ¢/kWh			
Low Season (Oct-May)	12.7 ¢/kWh																							

TIME-OF-USE RATE OPTIONS:

Option 1: Electric Vehicle Time-of-Use – Keep your house on the Standard rate and install a separate service for your EV to be on a TOU rate with the discount on off-peak charging (weekdays, 8 pm to 10 am, and all day on weekends). Option 1 requires a qualified electrician to install a second service at your house to exclusively serve the EV charger. You'll want to consult your electrician to see if the upfront cost is justified based on your expected energy usage and discount. All charging during the off-peak period would have the 2.5 cent discount applied for an average rate of 9.5 ¢/kWh. Please note that Solar customers with net metering must use Option 1 in order to take advantage of the EV discount.

Option 2: Residential Time-of-Use and Electric Vehicle Discount – Move your whole house to a TOU rate and receive a block of energy at a discount during off-peak periods. Option 2 requires a TOU meter change by LADWP. This rate is best for customers who use most of their energy at night, during off-peak hours, when the rate is lower. Through this rate, you are given a block of energy at the 2.5 cent/kWh discount. Currently, the block is 500 kilowatt-hours (kWh).[†]

A service fee of $8/month applies to both options.

[*] Zones are defined by zip code on www.ladwp.com. Generally, Zone 1 applies in non-Valley areas and Zone 2 in the Valley.

[†] Subject to change

LA DWP

For more information please visit our website at

www.ladwp.com/ev

www.socalev.org

or email us directly at PluginLA@ladwp.com

or call 1-800-DIAL DWP

11/2010

New York City

I. Incentive: New York City Private Fleet Program

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

The public-private partnership of The New York State Energy Research and Development Authority (NYSERDA with the New York City Department of Transportation (NYC DOT) is designed to encourage the use of alternative-fuel vehicles (AFVs) and emission controls by private-sector companies and non-profit entities operating vehicles in New York City.

NYSERDA will fund up to:
• 50% of the incremental cost of acquiring or converting one or more new, dedicated-compressed natural gas
(CNG) or electric light-duty vehicles (gross vehicle weight # 14,000 pounds);
• 80% of the incremental cost for acquiring one or more new, dedicated-CNG, electric, or hybrid-electric, medium- and/or heavy-duty vehicles (gross vehicle weight > 14,000 pounds);
• 80% of the cost of converting one or more medium- and/or heavy-duty vehicles to dedicated-CNG use or to dual-fuel technology optimized to use 80% CNG; and
• 50% of the cost for equipment and installation of CNG refueling equipment or electric vehicle charging equipment up to a maximum of $300,000 per project (Total combined amount awarded under the infrastructure category for all projects awarded funding in this round will not exceed $600,000).

III. Point of Contact: Ari Kahn, Electric Vehicle Policy Analyst, New York City Sustainability Office
Email: AKahn2@cityhall.nyc.gov

Cincinnati

I. Incentive: All-Electric Vehicle Free Parking Program

II. Details: The City's All-Electric Vehicle Incentive Pilot Program offers FREE parking to all-electric vehicles at three City-owned garages and one City-owned parking lot located in the downtown area.

This incentive program also includes free parking to all-electric vehicles at any parking meter within the Cincinnati city limits.

III. Point of Contact: Larry Falkin, Director, Office of Environmental Quality
Email: larry.falkin@cincinnati-oh.gov

*Please see sample form below

Electric Car Incentive Program

Application

PLEASE PRINT

Applicant Name	
Street Address	
City, State Zip	
E-mail	
Phone	
Cell Phone	

Agreement: I have read and understand the City of Cincinnati's Electric Car Incentive Program policies and procedures. By signing this document I acknowledge that I received a copy of the City of Cincinnati Electric Car Incentive Program policies and procedures and will adhere to said policies and procedures. I also understand that my parking permit will expire on January 1, 2012.

Applicant Signature		
Permit Number Issued	Permit No. _____	A copy of the Electric Car Incentive Program policies and procedures was given to the permit holder on _____ (Date)
Make/Model		
VIN Number		
License Plate Number		
Employee Signature		

Electric Vehicle Inspection:

I, _____ (Employee) on_____ (Date) physically inspected the following vehicle for eligibility to participate in the City of Cincinnati Electric Car Incentive Program.

The vehicle listed below is _____ / is not _____ an ALL Electric Vehicle and is _____ / is not _____ eligible for free parking in the identified City owned downtown facilities and all parking meters located within the City of Cincinnati city limits in accordance with the Electric Car Incentive Program policies and procedures.

References

Federal Incentives

- http://www.law.cornell.edu/uscode/text/26/30D
- http://www.fueleconomy.gov/feg/taxevb.shtml
- http://www.edmunds.com/fuel-economy/the-ins-and-outs-of-electric-vehicle-tax-credits.html

Georgia Incentives

Income Tax Credits

- http://www.afdc.energy.gov/afdc/laws/law/GA/5180
- http://www.gaepd.org/Files_PDF/forms/apb/apb_levzevfs.pdf
- http://www.gaepd.org/Files_PDF/forms/apb/apb_LEVZEVTAX.pdf

Miscellaneous Incentives

Alternative Fuel Vehicle License Plate and HOV Lane Access

- http://motor.etax.dor.ga.gov/motor/plates/platesamples.aspx

Alternative Fuel Vehicle (AFV) High Occupancy Toll (HOT) Lane Exemption

- http://www.afdc.energy.gov/afdc/laws/law/GA/5183
- http://motor.etax.dor.ga.gov/motor/plates/platesamples.aspx
- http://www.peachpass.com/about/exempt-vehicles
- http://www.peachpass.com/peach-pass-customers/get-a-peach-pass

Plug-In Electric Vehicle Charging Rate Incentive - Georgia Power

- http://www.georgiapower.com/electricvehicles/rate_options.asp
- http://www.afdc.energy.gov/afdc/laws/law/GA/9372

South Carolina Incentives

Income Tax Credit

- http://www.scstatehouse.gov/sess119_2011-2012/bills/3059.htm
- http://www.sctax.org/Forms+and+Instructions/2011/taxCredits/default.htm

Alabama Incentives

Plug-In Electric Vehicle Charging Rate Incentive - Alabama Power

- http://www.afdc.energy.gov/afdc/laws/law/AL/9374

State Incentives

Comprehensive List

- http://www.pluginamerica.org/incentives

Oregon

- http://www.chargeportland.com
- One-step Application for Hybrid-Electric Vehicles Oregon Business Energy Tax Credit.pdf
- http://www.oregon.gov/energy

Nebraska

- http://www.neo.ne.gov/loan/
- http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NE01F

Municipal Incentives

Los Angeles

- http://www.socalev.org/plugin/incentives.htm
- https://www.ladwp.com/ladwp/faces/ladwp/residential

New York City

- http://www.nyserda.ny.gov/Funding-Opportunities
- http://www.nyserda.ny.gov

Cincinnati

- http://www.cincinnati-oh.gov/cmgr/pages/-36360-/

Section 3.4.6 – EVSE and Installation RFP (Durham County, NC)

REQUEST FOR PROP0SALS

DURHAM COUNTY ELECTRIC VEHICLE SUPPLY EQUIPMENT AND INSTALLATION

SCOPE OF WORK

PURPOSE: The purpose and intent of this Request for Proposals (RFP) is to solicit proposals from qualified Contractor(s) to establish a contract to provide Level II Electric Vehicle Supply Equipment (EVSE) stations at multiple County facilities, along with turnkey installation services.

BACKGROUND: Durham County has a history of promoting environmental sustainability, including reducing air pollution from vehicles. As part of that continuing commitment and in preparation for the arrival of electric vehicles to the local market, Durham County is interested in installing EVSE at up to 6 (six) facilities. Durham County is eligible for American Recovery and Reinvestment Act (ARRA) funding to cover some of the cost of EVSE installation and equipment.

STATEMENT OF NEED: The County of Durham is seeking a qualified contractor that will manage, perform, and document the Electric Vehicle Charging Station Project. The contractor selected must demonstrate an understanding of the electrical EVSE industries and have demonstrated skills in managing similar projects.
Six (6) County facilities are currently candidates for provisioning of EVSE equipment. Each of these facilities are included in this RFP as potential candidates for implementation, however the County may decide to implement EVSE at a subset of these facilities in the initial contract. Each facility will have varying parking configurations requiring a variety of approaches to implementation, including wall and pedestal mounting of single or multiple station EVSEs. This request is not limited to one EVSE manufacturer.
The response to this RFP should assume the implementation EVSE charging capability for two vehicle parking spaces at each facility using the most cost effective and/or desirable solution based on the facility's specific conditions.
Additionally, the County will also consider a proposal for enabling four parking spaces at a facility using a four-station EVSE where the layout is appropriate and cost effective.
The proposal should include all required electrical provisioning to the point of installation, appropriate signage, protection bollards, etc. for a complete, turnkey solution that complies with all applicable national, state and local code requirements. The amount of electrical design and provisioning will vary based on the requirements stated for each facility.
Pricing and analysis should be provided separately for each of the proposed facilities.

Additionally, the RFP response should discuss the bidder's approach and fees related to ongoing support and maintenance.

PROPOSAL FORM

The County of Durham invites your sealed proposal to provide Level II electric vehicle supply equipment (EVSE) stations at multiple County facilities, along with turnkey installation services.

In accordance with the attached instructions, terms, conditions, and specifications, we submit the following proposal to the County of Durham.

PROPOSED COST

Facility	EVSE Equipment	Ancillary Equipment/Services	Total Cost
a) Human Services	$_____	$_____	$_____
b) Courthouse	$_____	$_____	$_____
c) South Library	$_____	$_____	$_____
d) North Library	$_____	$_____	$_____
e) Main Library	$_____	$_____	$_____
f) Southwest Library	$_____	$_____	$_____

Total Cost

$_____

I certify that the contents of this proposal are known to no one outside the firm, and to the best of my knowledge all requirements have been complied with.

Date:_____ Authorized Signature:_____

DETAILED REQUIREMENTS

Facility Descriptions

The County is committed to installing EVSE in locations that can be used by citizens for short-term opportunity charges during the day. The County's preference is for dual-stations (one physical pole set to serve two parking spaces so that two cars can charge simultaneously) because this arrangement seems to provide the most electric vehicle charging parking places for the money. However, proposals may include pricing for both single and multiple EVSE charging stations.

Viewing of the facilities, including the electrical closets will require prior approval and coordination through County staff.

Durham County Human Services Complex – 400 Main Street, Durham, NC

This building is currently under construction on the 400 block of Main Street. The EVSE's will be located in an adjacent surface parking lot which is located on the 500 block of Main Street. Six one inch conduits have been placed at six designated locations for EVSEs for the provision of electrical power. Conduits have also been placed at each designated location for a future data connection to the ESVEs. The response to this RFP should address the provisioning of ESVE equipment at a single designated parking location, serving two adjacent parking spaces. The additional designated locations will be implemented at a future date. For this facility, the RFP response should identify the power requirements needed to satisfy the proposed ESVE equipment. The actual implementation of the electrical circuit to the ESVE equipment location will be performed by the current building contractor under a change order issued by the County.

Durham County Courthouse – Mangum Street, Durham, NC

This building is currently under construction on a site adjacent to the Durham County Jail, on a block bordered by Dillard, Mangum, and Roxboro Streets. The EVSE's will be located in an adjacent multi-level parking garage. Parking spaces have been designated for ESVE equipment and conduit has been run to the wall locations in front of each designated space for electrical power and future data connections. ESVEs are intended to be wall-mounted. The response to this RFP should address the provisioning of ESVE equipment to serve two designated parking locations, with either a single or two-station ESVE. The additional designated locations will be implemented at a future date. For this facility, the RFP response should identify the power requirements needed to satisfy the proposed ESVE equipment. The actual implementation of the electrical circuit to the ESVE equipment location will be performed by the current building contractor under a change order issued by the County.

Durham County Library – South Regional Branch – 4505 S. Alston Avenue, Durham, NC

This building was recently completed. The EVSE's will be located in a surface parking lot. Four one inch conduits have been placed from the electrical closet in the building to a parking lot island adjacent to the designated location of the ESVEs. Two of the conduits are designated for ESVE

power and the other two are designated for a future data connection to the ESVE. The spaces are laid out such that a two-station ESVE could serve two adjacent spaces, or optionally, a four- station ESVE could serve those two spaces and two additional spaces on the opposite side of the island. Electrical power requirements for the ESVEs will need to be assessed and provided for this facility as part of the RFP response.

Durham County Library – North Regional Branch – 221 Milton Road, Durham, NC

This building was completed in the last four years. The EVSE's will be located in a surface parking lot. No conduits or other provisioning has been provided for the implementation of ESVE equipment. The spaces are laid out such that a two-station ESVE could serve two adjacent spaces, or optionally, a four- station ESVE could serve those two spaces and two additional spaces on the opposite side of the island. Electrical power requirements for the ESVEs will need to be assessed and provided for this facility as part of the RFP response.

Durham County Library – Main Library – 300 N. Roxboro Street, Durham, NC

The EVSE's will be located in a surface parking lot. No conduits or other provisioning has been provided for the implementation of ESVE equipment. The spaces are laid out such that a two-station ESVE could serve two adjacent spaces. Electrical power requirements for the ESVEs will need to be assessed and provided for this facility as part of the RFP response.

Durham County Library – Southwest Regional Branch – 3605 Shannon Road, Durham, NC

This building was recently completed. The EVSE's will be located in a surface parking lot. Two one inch conduits have been stubbed out of the building foundation from the electrical closet for support of ESVE equipment. One of the conduits is designated for ESVE power and the other is designated for a future data connection to the ESVE. The spaces are laid out such that a two-station ESVE could serve two adjacent spaces. Electrical power requirements for the ESVEs will need to be assessed and provided for this facility as part of the RFP response.

Proposed Solution

The RFP response should include a description of the proposed solution for each facility and any considerations that may warrant a revised location for the EVSE placement, location adequacy, or ability to meet NEC 625 or comply with local requirements.

3. EVSE Selection and Requirements

The County of Durham is seeking quality EVSEs for its countywide infrastructure. The selected EVSE Provider must be able to deliver and service high quality products beyond the installation period.

The following tables contain a list of specific requirements for the EVSE consideration that should be addressed as part of the RFP response:

EVSE REQUIREMENTS	MEETS REQ(Y/N)
GENERAL EVSE REQUIREMENTS	
Equipment must be durable to withstand area's extreme weather conditions	
EVSEs that will accommodate the needs of the full range of vehicles requiring access to electrical charging, including plug-in hybrids and all-electric vehicles.	
EVSEs that universally accommodate vehicles from all manufacturers, and that comply with all applicable building codes, SAE standards, UL safety codes, ADA requirements and industry standards.	
EVSEs that meet customers' EV charging needs in any or all key locations including commercial garages and parking lots, transit hubs, workplace locations, and on-street parking in residential neighborhoods.	
Use of "smart charging" concepts to minimize charging during on-peak hours and to maximize customer convenience, and which are compatible with the utility industry's Advanced Metering Infrastructure systems ("smart meters")	
Provision of attractive EV charging with conventional billing rates for customers, and convenient billing systems.	
Consideration of means to accommodate the extended-range needs of EV drivers, such as fast charging.	
Provisions for maintenance requirements and other ancillary services provided by vendor or distributer.	
Warranty period for equipment and installation of equipment.	

TECHNOLOGY ENVIRONMENT FOR EVSE REQUIREMENTS
Specify Applicable Technical EVSE specifications, listing and testing such as:

SAE Standards met: SAE J551 Electromagnetic compatibility standards SAE J1772™ Conductive 5-pin coupling for EVSE SAE J1850 Communication network between EVSE and the EV SAE J2178 Message format for the communication network SAE J2293 Energy transfer system, umbrella document for EV standards SAE J2294 Onboard power charger quality SAE J2836 Digital communications use case between EVSE and vehicle SAE J2847 Digital communications specifications	
UL Listed / Tested UL 2202 Safety of EVSE UL 2231 Shock prevention measures for EVSE UL 2251 Safety of cord set	
Circuit re-closure – remote or automatic re-energized after a fault has cleared	
Cold load pickup (random restart after power outage)	
Load management connection (for future utility control)	
Input voltage and amperage range	
Self testing – diagnostics, safety, ground monitor, etc.	
Diagnostic status indicator	
Operating temperature range	
Mounting – wall, pedestal, other	
Equipment must meet the emerging open standard of the industry and avoids proprietary subscriber networks	
Equipment that can communicate the EVSEs availability is preferred yet not necessary	
Equipment that can accept payment is not necessary for this project but having the ability to do so in the future is preferred	
Charge status display	
EVSE dimensions	
EVSE footprint dimensions (for installation)	

Project Deliverables

The overall goal of the project is a turnkey design and implementation of an electric vehicle charging infrastructure at multiple selected facilities within the County. The following table contains a list of

specific deliverables to be included in the project, although the list should not be considered to be exhaustive. The scope of some items will vary depending on the requirements stated for each facility.

As part of the RFP response, the bidder should provide a proposed schedule for the work.

DELIVERABLES
[Deliverable Group #1] (ESVE Equipment)
Purchase of Level II Electric Vehicle Service Equipment Units as approved by County
[Deliverable Group #2] (Installation, for each of the candidate facilities)
1. Load calculation and electrical drawings
2. Required permits – e.g. electrical, right of way
3. Location of underground utilities
4. Installation of conduit groundwork
5. Installation of spare conduit for future EVSE
6. Proper scheduled inspections
7. Electrical disconnect within site of unit, if required
8. Installation of EVSE equipment
9. Signage – EVSE identification sign, directional signage and ADA signage
10. Proper striping of parking spaces
11. Protection of EVSE unit from potential physical damage (i.e. bollards)
12. Repair of sidewalks, landscaping upon completion of the EVSE installation
13. Skills transfer to County employees
14. Closeout Documents typical of a construction project (O&M Manuals, Warranties, Contractor/Subcontractor Affidavits, Record Drawings)

Finalists / Vendor Short List

Proposals will be examined promptly after opening and a selection committee will be organized to evaluate the responses. Based on the evaluation of the proposals, the County will select a short list of vendors and invite them for an interview, and optionally an onsite functional and technical demonstration of the proposed EVSE product. Vendors who are not selected for interviews will also be notified of their status.

Price Proposals

The County's objective of the evaluation will be to achieve the best balance of the performance and price for this effort. The County requires that all requested elements requested in the RFP be addressed.

Final Selection

The selection committee will interview the short list candidates and make a selection for discussions leading to a contract, and the remaining firms will be notified of their status. The prices quoted must be held firm for 180 days after the proposal is due. The County reserves the right to make an award without further discussion of the proposal submitted. The County shall not be bound or in any way obligated until both parties have executed a contract. The County also reserves the right to delay contract award, not to make a contract award, or to make a separate award for the purchase of EVSEs or the installation of said equipment.

The general conditions and specifications of the RFP and the successful vendor's response, as amended by agreement between the County and the vendor, including e-mail or written correspondence relative to the RFP, may become part of the contract documents. Failure of the vendor's products to perform as represented may result in elimination of the vendor from competition or in contract cancellation or termination.

Special Provisions Relating to Work Funded Under American Recovery and Reinvestment Act of 2009 (May 2009)

Preamble

The American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, (Recovery Act) was enacted to preserve and create jobs and promote economic recovery, assist those most impacted by the recession, provide investments needed to increase economic efficiency by spurring technological advances in science and health, invest in transportation, environmental protection, and other infrastructure that will provide long-term economic benefits, stabilize State and local government budgets, in order to minimize and avoid reductions in essential services and counterproductive State and local tax increases. Recipients shall use grant funds in a manner that maximizes job creation and economic benefit.

The Recipient shall comply with all terms and conditions in the Recovery Act relating generally to governance, accountability, transparency, data collection and resources as specified in Act itself and as discussed below.

Be advised that Recovery Act funds can be used in conjunction with other funding as necessary to complete projects, but tracking and reporting must be separate to meet the reporting requirements of the Recovery Act and related guidance. For projects funded by sources other than the Recovery Act, Contractors must keep separate records for Recovery Act funds and to ensure those records comply with the requirements of the Act.

The Government has not fully developed the implementing instructions of the Recovery Act, particularly concerning specific procedural requirements for the new reporting requirements. The Recipient will be

provided these details as they become available. The Recipient must comply with all requirements of the Act. If the recipient believes there is any inconsistency between ARRA requirements and current award terms and conditions, the issues will be referred to the Contracting Officer for reconciliation.

Definitions

For purposes of this clause, Covered Funds means funds expended or obligated from appropriations under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5. Covered Funds will have special accounting codes and will be identified as Recovery Act funds in the grant, cooperative agreement or TIA and/or modification using Recovery Act funds. Covered Funds must be reimbursed by September 30, 2015.

Non-Federal employer means any employer with respect to covered funds -- the contractor, subcontractor, grantee, or recipient, as the case may be, if the contractor, subcontractor, grantee, or recipient is an employer; and any professional membership organization, certification of other professional body, any agent or licensee of the Federal government, or any person acting directly or indirectly in the interest of an employer receiving covered funds; or with respect to covered funds received by a State or local government, the State or local government receiving the funds and any contractor or subcontractor receiving the funds and any contractor or subcontractor of the State or local government; and does not mean any department, agency, or other entity of the federal government.

Recipient means any entity that receives Recovery Act funds directly from the Federal government (including Recovery Act funds received through grant, loan, or contract) other than an individual and includes a State that receives Recovery Act Funds.

Special Provisions

A. Flow Down Requirement

Recipients must include these special terms and conditions in any subaward.

B. Segregation of Costs

Recipients must segregate the obligations and expenditures related to funding under the Recovery Act. Financial and accounting systems should be revised as necessary to segregate, track and maintain these funds apart and separate from other revenue streams. No part of the funds from the Recovery Act shall be commingled with any other funds or used for a purpose other than that of making payments for costs allowable for Recovery Act projects.

C. Prohibition on Use of Funds
None of the funds provided under this agreement derived from the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, may be used by any State or local government, or any private entity, for any casino or other gambling establishment, aquarium, zoo, golf course, or swimming pool.

D. Access to Records

With respect to each financial assistance agreement awarded utilizing at least some of the funds appropriated or otherwise made available by the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, any representative of an appropriate inspector general appointed under section 3 or 8G of the Inspector General Act of 1988 (5 U.S.C. App.) or of the Comptroller General is authorized --

(1) to examine any records of the contractor or grantee, any of its subcontractors or subgrantees, or any State or local agency administering such contract that pertain to, and involve transactions that relate to, the subcontract, subcontract, grant, or subgrant; and

(2) to interview any officer or employee of the contractor, grantee, subgrantee, or agency regarding such transactions.

E. Publication

An application may contain technical data and other data, including trade secrets and/or privileged or confidential information, which the applicant does not want disclosed to the public or used by the Government for any purpose other than the application. To protect such data, the applicant should specifically identify each page including each line or paragraph thereof containing the data to be protected and mark the cover sheet of the application with the following Notice as well as referring to the Notice on each page to which the Notice applies:

Notice of Restriction on Disclosure and Use of Data

The data contained in pages ---- of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data here to the extent provided in the award. This restriction does not limit the Government's right to use or disclose data obtained without restriction from any source, including the applicant.

Information about this agreement will be published on the Internet and linked to the website www.recovery.gov, maintained by the Accountability and Transparency Board. The Board may exclude posting contractual or other information on the website on a case-by-case basis when necessary to protect national security or to protect information that is not subject to disclosure under sections 552 and 552a of title 5, United States Code.

F. Protecting State and Local Government and Contractor Whistleblowers.

The requirements of Section 1553 of the Act are summarized below. They include, but are not limited to:

Prohibition on Reprisals: An employee of any non-Federal employer receiving covered funds under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing, including a disclosure made in the ordinary course of an employee's duties, to the Accountability and Transparency Board, an inspector general, the Comptroller General, a member of Congress, a State or Federal regulatory or law enforcement agency, a person with supervisory authority over the employee (or other person working for the employer who has the authority to

investigate, discover or terminate misconduct), a court or grant jury, the head of a Federal agency, or their representatives information that the employee believes is evidence of:

- gross management of an agency contract or grant relating to covered funds;
- a gross waste of covered funds;
- a substantial and specific danger to public health or safety related to the implementation or use of covered funds;
- an abuse of authority related to the implementation or use of covered funds; or
- as violation of law, rule, or regulation related to an agency contract (including the competition for or negotiation of a contract) or grant, awarded or issued relating to covered funds.

Agency Action: Not later than 30 days after receiving an inspector general report of an alleged reprisal, the head of the agency shall determine whether there is sufficient basis to conclude that the non-Federal employer has subjected the employee to a prohibited reprisal. The agency shall either issue an order denying relief in whole or in part or shall take one or more of the following actions:

- Order the employer to take affirmative action to abate the reprisal.
- Order the employer to reinstate the person to the position that the person held before the reprisal, together with compensation including back pay, compensatory damages, employment benefits, and other terms and conditions of employment that would apply to the person in that position if the reprisal had not been taken.
- Order the employer to pay the employee an amount equal to the aggregate amount of all costs and expenses (including attorneys' fees and expert witnesses' fees) that were reasonably incurred by the employee for or in connection with, bringing the complaint regarding the reprisal, as determined by the head of a court of competent jurisdiction.

Nonenforceability of Certain Provisions Waiving Rights and remedies or Requiring Arbitration: Except as provided in a collective bargaining agreement, the rights and remedies provided to aggrieved employees by this section may not be waived by any agreement, policy, form, or condition of employment, including any predispute arbitration agreement. No predispute arbitration agreement shall be valid or enforceable if it requires arbitration of a dispute arising out of this section.

Requirement to Post Notice of Rights and Remedies: Any employer receiving covered funds under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, shall post notice of the rights and remedies as required therein. (Refer to section 1553 of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, www.Recovery.gov, for specific requirements of this section and prescribed language for the notices.).

G. Reserved

H. False Claims Act

Recipient and sub-recipients shall promptly refer to the DOE or other appropriate Inspector General any credible evidence that a principal, employee, agent, contractor, sub-grantee, subcontractor or other person has submitted a false claim under the False Claims Act or has committed a criminal or civil violation of laws pertaining to fraud, conflict of interest, bribery, gratuity or similar misconduct involving those funds.

I. Information in Support of Recovery Act Reporting

Recipient may be required to submit backup documentation for expenditures of funds under the Recovery Act including such items as timecards and invoices. Recipient shall provide copies of backup documentation at the request of the Contracting Officer or designee.

J. Availability of Funds

Funds obligated to this award are available for reimbursement of costs until 36 months after the award date.

REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT

(a) This award requires the recipient to complete projects or activities which are funded under the American Recovery and Reinvestment Act of 2009 (Recovery Act) and to report on use of Recovery Act funds provided through this award. Information from these reports will be made available to the public.

(b) The reports are due no later than ten calendar days after each calendar quarter in which the Recipient receives the assistance award funded in whole or in part by the Recovery Act.

(c) Recipients and their first-tier subrecipients must maintain current registrations in the Central Contractor Registration (*http://www.ccr.gov*) at all times during which they have active federal awards funded with Recovery Act funds. A Dun and Bradstreet Data Universal Numbering System (DUNS) Number (*http://www.dnb.com*) is one of the requirements for registration in the Central Contractor Registration.

(d) The recipient shall report the information described in section 1512(c) of the Recovery Act using the reporting instructions and data elements that will be provided online at *http://www.FederalReporting.gov* and ensure that any information that is pre-filled is corrected or updated as needed.

NOTICE REGARDING THE PURCHASE OF AMERICAN-MADE EQUIPMENT AND PRODUCTS -- SENSE OF CONGRESS

It is the sense of the Congress that, to the greatest extent practicable, all equipment and products purchased with funds made available under this award should be American-made.

*Special Note: Definitization of the Provisions entitled, “REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009” and “REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS) – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009” will be done upon definition and review of final activities.

REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

(a) *Definitions.* As used in this award term and condition—

(1) *Manufactured good* means a good brought to the construction site for incorporation into the building or work that has been—
(i) Processed into a specific form and shape; or

(ii) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.
(2) *Public building and public work* means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.
(3) *Steel* means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.
(b) *Domestic preference.* (1) This award term and condition implements Section 1605 of the American Recovery and Reinvestment Act of 2009 (Recovery Act) (Pub. L. 111–5), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States except as provided in paragraph (b)(3) and (b)(4) of this section and condition.
(2) This requirement does not apply to the material listed by the Federal Government as follows:
To Be Determined
(3) The award official may add other iron, steel, and/or manufactured goods to the list in paragraph (b)(2) of this section and condition if the Federal Government determines that—
(i) The cost of the domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the cost of the overall project by more than 25 percent;
(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.
(c) *Request for determination of inapplicability of Section 1605 of the Recovery Act* . (1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(3) of this section shall include adequate information for Federal Government evaluation of the request, including—
(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;
(B) Unit of measure;
(C) Quantity;
(D) Cost;
(E) Time of delivery or availability;
(F) Location of the project;
(G) Name and address of the proposed supplier; and
(H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(3) of this section.
(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this section.

(iii) The cost of iron, steel, and/or manufactured goods material shall include all delivery costs to the construction site and any applicable duty.

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal Government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods is noncompliant with section 1605 of the American Recovery and Reinvestment Act.

(d) *Data.* To permit evaluation of requests under paragraph (b) of this section based on unreasonable cost, the Recipient shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Items Cost Comparison

Description	**Unit of measure**	**Quantity**	**Cost (dollars)***
Item 1:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____
Item 2:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____

List name, address, telephone number, email address, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

**Include all delivery costs to the construction site.*

REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS) – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

(a) *Definitions.* As used in this award term and condition—

Designated country — (1) A World Trade Organization Government Procurement Agreement country (Aruba, Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Republic of), Latvia, Liechtenstein,

Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and United Kingdom;
(2) A Free Trade Agreement (FTA) country (Australia, Bahrain, Canada, Chile, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Israel, Mexico, Morocco, Nicaragua, Oman, Peru, or Singapore); or
(3) A United States-European Communities Exchange of Letters (May 15, 1995) country: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, and United Kingdom.
Designated country iron, steel, and/or manufactured goods — (1) Is wholly the growth, product, or manufacture of a designated country; or
(2) In the case of a manufactured good that consist in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different manufactured good distinct from the materials from which it was transformed.
Domestic iron, steel, and/or manufactured good — (1) Is wholly the growth, product, or manufacture of the United States; or
(2) In the case of a manufactured good that consists in whole or in part of materials from another country, has been substantially transformed in the United States into a new and different manufactured good distinct from the materials from which it was transformed. There is no requirement with regard to the origin of components or subcomponents in manufactured goods or products, as long as the manufacture of the goods occurs in the United States.
Foreign iron, steel, and/or manufactured good means iron, steel and/or manufactured good that is not domestic or designated country iron, steel, and/or manufactured good.
Manufactured good means a good brought to the construction site for incorporation into the building or work that has been—
(1) Processed into a specific form and shape; or
(2) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.
Public building and *public work* means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.
Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.
(b) *Iron, steel, and manufactured goods.* (1) The award term and condition described in this section implements—

(i) Section 1605(a) of the American Recovery and Reinvestment Act of 2009 (Pub. L. 111–5) (Recovery Act), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States; and

(ii) Section 1605(d), which requires application of the Buy American requirement in a manner consistent with U.S. obligations under international agreements. The restrictions of section 1605 of the Recovery Act do not apply to designated country iron, steel, and/or manufactured goods. The Buy American requirement in section 1605 shall not be applied where the iron, steel or manufactured goods used in the project are from a Party to an international agreement that obligates the recipient to treat the goods and services of that Party the same as domestic goods and services. This obligation shall only apply to projects with an estimated value of $7,443,000 or more.

(2) The recipient shall use only domestic or designated country iron, steel, and manufactured goods in performing the work funded in whole or part with this award, except as provided in paragraphs (b)(3) and (b)(4) of this section.

(3) The requirement in paragraph (b)(2) of this section does not apply to the iron, steel, and manufactured goods listed by the Federal Government as follows:

To Be Determined

(4) The award official may add other iron, steel, and manufactured goods to the list in paragraph (b)(3) of this section if the Federal Government determines that—

(i) The cost of domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, and/or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the overall cost of the project by more than 25 percent;

(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) *Request for determination of inapplicability of section 1605 of the Recovery Act or the Buy American Act.* (1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(4) of this section shall include adequate information for Federal Government evaluation of the request, including—

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;

(B) Unit of measure;

(C) Quantity;

(D) Cost;

(E) Time of delivery or availability;

(F) Location of the project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(4) of this section.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this section.

(iii) The cost of iron, steel, or manufactured goods shall include all delivery costs to the construction site and any applicable duty.

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could

not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.
(2) If the Federal Government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When
the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other appropriate actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds, as appropriate, by at least the differential established in 2 CFR 176.110(a).
(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods other than designated country iron, steel, and/or manufactured goods is noncompliant with the applicable Act.
(d) *Data.* To permit evaluation of requests under paragraph (b) of this section based on unreasonable cost, the applicant shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Items Cost Comparison

Description	**Unit of measure**	**Quantity**	**Cost (dollars)***
Item 1:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____
Item 2:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____

List name, address, telephone number, email address, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.
Include other applicable supporting information.
**Include all delivery costs to the construction site.*

WAGE RATE REQUIREMENTS UNDER SECTION 1606 OF THE RECOVERY ACT
(a) Section 1606 of the Recovery Act requires that all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to the Recovery Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code.

Pursuant to Reorganization Plan No. 14 and the Copeland Act, 40 U.S.C. 3145, the Department of Labor has issued regulations at 29 CFR parts 1, 3, and 5 to implement the Davis-Bacon and related Acts. Regulations in

29 CFR 5.5 instruct agencies concerning application of the standard Davis-Bacon contract clauses set forth in that section. Federal agencies providing grants, cooperative agreements, and loans under the Recovery Act shall ensure that the standard Davis-Bacon contract clauses found in 29 CFR 5.5(a) are incorporated in any resultant covered contracts that are in excess of $2,000 for construction, alteration or repair (including painting and decorating).
(b) For additional guidance on the wage rate requirements of section 1606, contact your awarding agency. Recipients of grants, cooperative agreements and loans should direct their initial inquiries concerning the application of Davis-Bacon requirements to a particular federally assisted project to the Federal agency funding the project. The Secretary of Labor retains final coverage authority under Reorganization Plan Number 14.

RECOVERY ACT TRANSACTIONS LISTED IN SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS AND RECIPIENT RESPONSIBILITIES FOR INFORMING SUBRECIPIENTS
(a) To maximize the transparency and accountability of funds authorized under the American Recovery and Reinvestment Act of 2009 (Pub. L. 111–5) (Recovery Act) as required by Congress and in accordance with 2 CFR 215.21 “Uniform Administrative Requirements for Grants and Agreements” and OMB Circular A–102 Common Rules provisions, recipients agree to maintain records that identify adequately the source and application of Recovery Act funds. OMB Circular A–102 is available at *http://www.whitehouse.gov/omb/circulars/a102/a102.html.*
(b) For recipients covered by the Single Audit Act Amendments of 1996 and OMB Circular A–133, “Audits of States, Local Governments, and Non-Profit Organizations,” recipients agree to separately identify the expenditures for Federal awards under the Recovery Act on the Schedule of Expenditures of Federal Awards (SEFA) and the Data Collection Form (SF–SAC) required by OMB Circular A–133. OMB Circular A–133 is available at *http://www.whitehouse.gov/omb/circulars/a133/a133.html.* This shall be accomplished by identifying expenditures for Federal awards made under the Recovery Act separately on the SEFA, and as separate rows under Item 9 of Part III on the SF–SAC by CFDA number, and inclusion of the prefix “ARRA-” in identifying the name of the Federal program on the SEFA and as the first characters in Item 9d of Part III on the SF–SAC.
(c) Recipients agree to separately identify to each subrecipient, and document at the time of subaward and at the time of disbursement of funds, the Federal award number, CFDA number, and amount of Recovery Act funds. When a recipient awards Recovery Act funds for an existing program, the information furnished to subrecipients shall distinguish the subawards of incremental Recovery Act funds from regular subawards under the existing program.
(d) Recipients agree to require their subrecipients to include on their SEFA information to specifically identify Recovery Act funding similar to the requirements for the recipient SEFA described above. This information is needed to allow the recipient to properly monitor subrecipient expenditure of ARRA funds as well as oversight by the Federal awarding agencies, Offices of Inspector General and the Government Accountability Office.
DAVIS-BACON ACT REQUIREMENTS

Note: Where necessary to make the context of these articles applicable to this award, the term "Contractor" shall mean "Recipient" and the term "Subcontractor" shall mean "Subrecipient or Subcontractor" per the following definitions.
Recipient means the organization, individual, or other entity that receives an award from DOE and is financially accountable for the use of any DOE funds or property provided for the performance of the project, and is legally responsible for carrying out the terms and conditions of the award.

Subrecipient means the legal entity to which a subaward is made and which is accountable to the recipient for the use of the funds provided. The term may include foreign or international organizations (such as agencies of the United Nations).

Davis-Bacon Act

(a) Definition.--"Site of the work"--

(1) Means--

(i) The primary site of the work. The physical place or places where the construction called for in the award will remain when work on it is completed; and

(ii) The secondary site of the work, if any. Any other site where a significant portion of the building or work is constructed, provided that such site is--

(A) Located in the United States; and

(B) Established specifically for the performance of the award or project;

(2) Except as provided in paragraph (3) of this definition, includes any fabrication plants, mobile factories, batch plants, borrow pits, job headquarters, tool yards, etc., provided--

(i) They are dedicated exclusively, or nearly so, to performance of the award or project; and

(ii) They are adjacent or virtually adjacent to the "primary site of the work" as defined in paragraph (a)(1)(i), or the "secondary site of the work" as defined in paragraph (a)(1)(ii) of this definition;

(3) Does not include permanent home offices, branch plant establishments, fabrication plants, or tool yards of a Contractor or subcontractor whose locations and continuance in operation are determined wholly without regard to a particular Federal award or project. In addition, fabrication plants, batch plants, borrow pits, job headquarters, yards, etc., of a commercial or material supplier which are established by a supplier of materials for the project before opening of bids and not on the Project site, are not included in the "site of the work." Such permanent, previously established facilities are not a part of the "site of the work" even if the operations for a period of time may be dedicated exclusively or nearly so, to the performance of a award.

(b) (1) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at
time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, or as may be incorporated for a secondary site of the work, regardless of any contractual relationship which may be alleged to exist

between the Contractor and such laborers and mechanics. Any wage determination incorporated for a secondary site of the work shall be effective from the first day on which work under the award was performed at that site and shall be incorporated without any adjustment in award price or estimated cost. Laborers employed by the construction Contractor or construction subcontractor that are transporting portions of the building or work between the secondary site of the work and the primary site of the work shall be paid in accordance with the wage determination applicable to the primary site of the work.

(2) Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (e) of this article; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period.

(3) Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the article entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

(4) The wage determination (including any additional classifications and wage rates conformed under paragraph (c) of this article) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(c) (1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the award shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefore only when all the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination.

(ii) The classification is utilized in the area by the construction industry.

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives and the Contracting Officer agree on the classification and wage rate (including the amount
designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the:

Wage and Hour Division
Employment Standards Administration
U.S. Department of Labor
Washington, DC 20210

The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to be employed in the classification, or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (c)(2) and (c)(3) of this article shall be paid to all workers performing work in the classification under this award from the first day on which work is performed in the classification.

(d) Whenever the minimum wage rate prescribed in the award for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(e) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

Rates of Wages - Prior Approval for Proceeding with Davis-Bacon Construction Activities
If the Recipient determines at any time that any construction, alteration, or repair activity as defined by 29 CFR 5.2(j) (http://cfr.vlex.com/vid/5-2-definitions-19681309) will be performed during the course of the project, the Recipient shall request approval from the Contracting Officer prior to commencing such work. If the Contracting Officer concurs with the Recipient's determination, the Recipient must receive Contracting Officer approval to proceed with such activity, and must comply with all applicable Davis-Bacon requirements, prior to commencing such work. A modification to the award which incorporates the appropriate Davis-Bacon wage rate determination(s) will constitute the Contracting Officer's approval to proceed. If the Contracting Officer does not concur with the Recipient's determination, the Contracting Officer will so notify the Recipient in writing.

Section 3.4.5 – Sample Encroachment Agreement

ENCROACHMENT AGREEMENT

This Encroachment Agreement ("Agreement") is entered into as of the ____ day of _____, 201__, between the City of Atlanta, a municipal corporation, chartered pursuant to the laws of the State of Georgia (hereinafter "City"), and _____, ("Electric Vehicle Supply Equipment Owner").

WITNESSETH:

WHEREAS, in 2010, the City of Atlanta City Council passed the City's Sustainability Plan, which read that "Atlanta's sprawl growth pattern and dependence on cars continue to be [the City's] most significant obstacle to top tier sustainability ranking" and therefore, "aims to "enhance citizens' health, maintain clean air, and stabilize contributions to climate change" by "… implementing cutting edge policies (i.e., green building ordinances; electric vehicle infrastructure)…"; and

WHEREAS, the installation of electric vehicle supply equipment throughout the City, including in the public right-of-way, will encourage the increase the public's interest and awareness with regard to the purchase of electric powered vehicles; and

WHEREAS, the increase in usage of electric vehicles by the public will decrease pollution, decrease our dependence on foreign supplies of oil and gasoline; and

WHEREAS, the City has entered into a Memorandum of Understanding with Electric Vehicle Supply Equipment Owner wherein said party will be installing new electric vehicle supply equipment on private property and in the public right-of-way; and

WHEREAS, Electric Vehicle Supply Equipment Owner wishes to install fifteen (15) charging stations equipped with AC Level 2 electric vehicle supply equipment at locations throughout the City as set out in Exhibit "A" attached hereto (the "Encroachments" and/or "Charging Stations"); and

WHEREAS, the Commissioner of the Department of Public Works has reviewed the plans for the Encroachments and has determined that the installation of electric vehicle supply equipment will not adversely impact the ability of the affected right-of-way to handle pedestrian traffic or otherwise to perform its intended public function; and

WHEREAS, Electric Vehicle Supply Equipment Owner desires to both install and to maintain the Encroachments; and

WHEREAS, the Encroachments will constitute a non-conforming use under the City of Atlanta Code of Ordinances and laws of the State of Georgia and Electric Vehicle Supply Equipment Owner is legally responsible to either accept responsibility for proper installation and continued maintenance of said Encroachments; and

WHEREAS, the City of Atlanta Code of Ordinances, at Sections 138-20, 138-22 and 138-24, require that an Encroachment Agreement be entered into between the City and Electric Vehicle Supply Equipment Owner for authorization to install and maintain the Encroachments; and

WHEREAS, the City Council has authorized the Mayor, by Resolutions, to enter into an Encroachment Agreement for Non-Conforming Uses with Electric Vehicle Supply Equipment Owner, allowing Electric Vehicle Supply Equipment Owner to install, maintain, operate and use the aforesaid Encroachments in the public right-of-way; and

WHEREAS, said request was granted and authorized by a Resolution (No. 12-R-_____) adopted on _____, 2012 by the Council of the City and became effective on _____, 2012, and a true and correct copy of said Resolution is attached hereto as Exhibit "B" and by this reference made a part hereof (hereinafter referred to as the "Resolution"); and

WHEREAS, said permission was contingent upon an agreement being entered into by and between the City and the Electric Vehicle Supply Equipment Owner containing the conditions set forth in the Resolution; and

WHEREAS, the parties desire to enter into this Agreement in order to implement all provisions of the Resolution.

NOW, THEREFORE, for and in consideration of the mutual agreements between the parties hereinafter set forth and for other good and valuable consideration, the parties covenant and agree as follows:

1. **Public Benefit of Encroachments.** In the opinion of the Commissioner of City's Department of Public Works ("Commissioner"), the continued use, operation and maintenance of the Encroachments, as shown on the attached Exhibit "A", will constitute a benefit to the public so long as the Encroachment does not pose a risk to the health, welfare and safety of the public.

2. **Grant of Rights in Encroachment Areas.** The City grants to Electric Vehicle Supply Equipment Owner the right to operate, use, repair and maintain the Encroachments, as shown on the attached Exhibit "A". The Commissioner has reviewed the plans and has determined that the Encroachments will not adversely impact the ability of the affected right-of-way to handle vehicular or pedestrian traffic or otherwise to perform its intended public function. Accordingly, Electric Vehicle Supply Equipment Owner shall not operate, use, repair or maintain any Encroachment not listed on the attached Exhibit "A".

3. **Agreement is Condition Precedent to Continued Use.** In addition to Electric Vehicle Supply Equipment Owner satisfying all other applicable legal, administrative or other requirements to ensure that the Encroachment Area is and will continue to be structurally sound, the execution of this Agreement by Electric Vehicle Supply Equipment Owner is a condition precedent to the City allowing the continued use and operation of the Encroachment Areas. This Agreement will bind Electric Vehicle Supply Equipment Owner, and Electric Vehicle Supply Equipment Owner's legal successors in interest or until the Agreement is terminated or otherwise expires.

4. **Plans, Calculations and Technical Specifications.** The Electric Vehicle Supply Equipment Owner shall submit plans, calculations, and technical specifications prepared by a professional engineer licensed to practice in the State of

Georgia, establishing that the Encroachments are sufficiently structurally sound. Such plans and specifications are subject to approval by the Commissioner, pursuant to the standards set forth in or promulgated under Chapter 138 of the City's Code of Ordinances and, when applicable, all other appropriate legal requirements or administrative rules, including, but not limited to, the standards of the Georgia Department of Transportation or the Federal Highway Administration, or any other governmental agency having jurisdiction over the right-of-way or Encroachment Areas.

5. **Public Liability Insurance.** Electric Vehicle Supply Equipment Owner agrees that it is required to indemnify and hold the City harmless from all claims arising out of the use of the Encroachment Areas and the construction, maintenance, or removal of the Encroachments in the Encroachment Area, and to maintain a policy of public liability insurance, at no expense to the City, satisfactory to the City, and naming the City as an additional named insured, in an amount of at least $_____ per occurrence subject to a $_____ general aggregate amount as required by the City's Risk Manager.

6. **Removal From and Restoration of Encroachment Area and Right-of-Way.** Electric Vehicle Supply Equipment Owner agrees to remove, at its cost, any or all of the Encroachments as described on Exhibit "A" and to replace any area beneath and including the right-of-way where the Encroachments are located, to a condition satisfactory to the City within ninety (90) days after being notified to do so by the Commissioner, without cost to the City, and to ensure that the facilities constructed and installed in the Encroachment Areas are removed and the Encroachment Areas and right-of-way returned to a condition satisfactory to the Commissioner under the following circumstances:

1. When the City's Department of Public Works determines that removal is required because of repairs that must be made to the right-of-way or because of infrastructure changes that must be made to the right-of-way; or

2. When the City's Department of Public Works determines that the Encroachment ceases to have continuous use, has a change in the type or degree of use, or if the structural or functional soundness of the Encroachment deteriorates due to lack of maintenance, damage by fire, flood, wind, or other act of God; or

3. When the City's Department of Public Works determines that removal is required for the safe and efficient use of the right-of-way by the public; or

4. When the City's Department of Public Works determines that removal is required to maintain the health, safety, property or welfare of the public.

Any notice issued by the City's Department of Public Works to remove the Encroachment for the reasons set out in subsections 6.1 through 6.4 above will not be issued except when no other reasonable option is available to the City's Department of Public Works.

7. **Compliance with the City's Code of Ordinances.** Electric Vehicle Supply Equipment Owner agrees at all times during the term of this Agreement to comply with all of the terms of the City's Code of Ordinances applicable to this Agreement, including, but not limited to Chapter 138.

8. **Compliance with Applicable Law; Reparation of Facilities and Utilities.** Electric Vehicle Supply Equipment Owner agrees to conduct all activities within the Encroachment Areas and right-of-way in accordance with all applicable local, state, and federal rules, regulations, and standards. Electric Vehicle Supply Equipment Owner agrees to maintain the private utilities and facilities installed and constructed in the Encroachment Areas in good condition, and will require its contractors to repair any damage to any City facilities caused by the contractor, and any public or private utilities.

9. **Reimbursement of Damages to the City.** Electric Vehicle Supply Equipment Owner agrees to require its contractors to repair any damage to the right-of-way or Encroachment Areas resulting from the contractors' use of the Encroachment Areas or the maintenance, repair or use of the utility facilities in the Encroachment Area and will require Electric Vehicle Supply Equipment Owner's contractors to reimburse the City for any damage to the right-of-way or Encroachment Areas resulting from the contractors' use of the Encroachment Areas or the construction, installation, maintenance, repair or use of the Encroachment Areas.

10. **Application Fee and Annual Inspection Fee.** Electric Vehicle Supply Equipment Owner agrees to pay to City, in advance of construction and or installation of the Encroachments, a one-time application fee of $1,300.00 and a yearly inspection fee of $100.00. The payment of the application fee is a condition precedent to the execution of this Agreement by the City.

11. **Annual Inspection.** Electric Vehicle Supply Equipment Owner agrees to provide an annual inspection of the Encroachment Areas to ensure that the same is in a safe and suitable condition for public use and travel, and to provide to the City a written report upon request.

12. **Non-Exclusivity Of Agreement.** This Agreement is not exclusive and does not negate any past, present, or future agreement that the City may enter into with any other utility and/or electric vehicle supply equipment owner or provider for use of the right-of-way.

13. **Notices**.

A. **Addresses:** The City and Electric Vehicle Supply Equipment Owner agree that all notices, demands, and requests required under this Agreement must be in writing and sent to the City or to Electric Vehicle Supply Equipment Owner addressed as follows:

TO THE CITY:

Commissioner
City of Atlanta, Department of Public Works
55 Trinity Avenue, S.W.
Atlanta, Georgia 30303

TO ELECTRIC VEHICLE SUPPLY EQUIPMENT OWNER Electric Vehicle Supply Equipment Owner PLEASE INCLUDE MAILING ADDRESS HERE

B. **Delivery.** All notices given by either party to the other under this Agreement must be in writing and may be delivered by:

1. regular mail, first class, postage prepaid;
2. certified or registered mail;
3. facsimile, with a hard copy sent within 24 hours of transmission by one of the other permitted delivery means; or
4. hand-delivery, to the parties at the addresses and facsimile numbers specified in the Clause titled "Addresses".

C. **Receipt.** Notices sent by mail will be deemed received three (3) days after deposit in the mail, properly addressed. Notices sent by certified or registered mail will be deemed to be received upon the date of the acknowledgment. Notices sent by facsimile will be deemed to be received upon successful transmission to the proper facsimile number; if the sender can produce a facsimile transmission confirmation report. Notices delivered by hand-delivery will be deemed to be received upon written acceptance by the respective party.

D. **Change of Address or Facsimile Number.** Either party may, at any time, change its respective address or facsimile number by sending written notice to the other party of the change.

14. **Default and Termination of Agreement.** If Electric Vehicle Supply Equipment Owner defaults in its performance of this Agreement, and fails to cure the default within thirty (30) days of the City's written notice to Electric Vehicle Supply Equipment Owner of the default [or if such default is not capable of being cured within thirty (30) days], Electric Vehicle Supply Equipment Owner has not commenced curing the default and diligently pursued such cure to completion within a reasonable amount of time), this Agreement may be terminated by the City upon ten (10) days prior written notice to Electric Vehicle Supply Equipment Owner. Upon termination of this Agreement by the City, Electric Vehicle Supply Equipment Owner must remove all Encroachments installed by it or on its behalf within the Encroachment Areas and replace any area beneath, and including, the right-of-way where the Encroachments were installed by it or on its behalf within the Encroachment Areas in accordance with this Agreement.

15. **Parties Bound.** This Agreement will be binding upon and inure to the benefit of the City and Electric Vehicle Supply Equipment Owner and their respective permitted successors, successors in title and assigns.

16. **Governing Law.** This Agreement will be construed under Georgia law. Electric Vehicle Supply Equipment Owner and the City fix jurisdiction and venue for any action brought with respect to this Agreement in Fulton County, Georgia.

17. **Entire Agreement**. This Agreement contains the entire agreement of the parties with respect to its subject matter and no representations or agreements, oral or otherwise, which are not set forth in the Agreement, will be of any force or effect.

CITY:

_____

MAYOR

ATTEST:

_____

MUNICIPAL CLERK (Seal)

APPROVED:

_____

COMMISSIONER, DEPARTMENT OF PUBLIC WORKS

ELECTRIC VEHICLE SUPPLY EQUIPMENT OWNER

BY: _____

NAME: _____

TITLE: _____

ATTEST:

_____

NOTARY PUBLIC

MY COMMISSION EXPIRES: _____ **[SEAL]**

APPROVED AS TO FORM:

_____

CITY ATTORNEY

Section 3.4.4 – Model Zoning Code Update

PROPOSED ORDINANCE

Executive Summary

Proposed ordinance relating to updating zoning district regulations for the development of an electric vehicle charging infrastructure includes the following:

1. Amendment to Definitions to include terms relating to electric vehicle.

2. Amendment to District Regulations to include electric vehicle charging stations (i.e., parking equipped with level-1 and level-2 EVSE) as a permitted accessory use and structure in all districts.

3. Amendment to District Regulations to include electric vehicle charging stations equipped with DC Fast Charge EVSE as a permitted accessory use and structure in the following districts: Residential General; Office-Institutional; Commercial; Industrial; certain Special Purpose Interest Districts; Neighborhood Commercial; Live Work; Mixed Use Planned Developments; and Mixed Residential Commercial.

4. Amendment to District Regulations to include electric vehicle battery exchange stations (termed as "battery exchange stations") as a permitted principal use and structure in the following districts: Commercial; Industrial; SPI-11, -15, -16, -18, -20, -21, and -22; and Mixed Residential Commercial. The battery exchange stations were limited to districts where automobile service stations are a permitted principal use and structure.

5. Amendment to Application of Zoning Regulations to create an incentive program that reduces the number of parking spaces necessary to meet minimum parking requirements. This program would count each parking space that is converted to or newly constructed as an electric vehicle parking space and/or electric vehicle charging station as three regular parking spaces in calculating whether minimum off-street parking requirements have been met. The program would apply in all districts and would be subject to certain limitations, while allowing the Department to reduce the incentive where the total number of parking spaces, including EV parking/charging stations, is inadequate for needs as determined through results of the incentive program.

6. Amendment to add General Design standards and criteria related to electric vehicle parking and charging stations in parking facilities. The design standards would be in the General and Supplementary Regulations section of the Zoning Code and detail aspects as location of EVSE installation, criteria for EVSE installation, wayfinding signs, example of signage to be used, etc.

A MODEL ORDINANCE RELATING TO THE DEVELOPMENT OF THE CITY OF _____'S ELECTRIC VEHICLE CHARGING INFRASTRUCTURE, AMENDING THE ZONING CODE TO PROVIDE DEFINITIONS RELATED TO ELECTRIC VEHICLE CHARGING AND TO DEFINE CERTAIN REGULATIONS RELATED THERETO.

WHEREAS, the Environmental Protection Division (OR ITS EQUIVALENT) of the state of _____ has assessed the air quality in the city of _____ as a "nonattainment" area for ozone; and

WHEREAS, a substantial percentage of all air pollution and greenhouse gas emissions in the city of _____ is derived from emissions in the transportation sector; and

WHEREAS, air pollution, in high levels, has been shown to cause premature death and to aggravate lung illnesses such as acute respiratory infections, asthma, chronic bronchitis, emphysema, and lung cancer, all of to which children and the elderly are more susceptible; and

WHEREAS, the use of alternative fuels, such as electricity, for transportation reduces air pollutants, including greenhouse gases, emitted from said sector; and

WHEREAS, the city of _____ can reduce air pollution and greenhouse gas emissions by encouraging the transition to electric vehicle use and facilitating the development of a convenient, cost-effective, citywide electric vehicle charging infrastructure; and

WHEREAS, the driving distance between battery charges in current, commercially available electric vehicle models is limited, which limited driving distance is a fundamental disadvantage to broad consumer adoption of electric vehicles, and in order to eliminate this disadvantage and to increase consumer acceptance and usage of electric vehicles, an infrastructure of convenient electric vehicle charging opportunities is essential and must be developed; and

WHEREAS, the use of alternative fuels, such as electricity, which are domestically produced, also reduces the reliance on imported sources of energy for transportation; and

WHEREAS, electricity is a sustainable and domestically produced source of transportation fuel that may be used to power motor vehicles with zero or ultra-low tailpipe emissions; and

WHEREAS, the use of vehicles with zero or ultra-low tailpipe emissions will help not only to improve air quality and to reduce greenhouse gas emissions, but will also help to create local jobs as more electric vehicles are adopted and transportation fuel expenditures are reinvested in domestic sources of energy; and

WHEREAS, the city of _____'s economic security is jeopardized by its near total reliance on imported petroleum for transportation purposes, and which supply of imported petroleum is vulnerable to interruptions, making its price extremely volatile; and

WHEREAS, the use of electricity as a source of transportation fuel diversifies the supply of transportation fuels available, resulting in a more stable and secure base for the local economy; and

WHEREAS, the cost of gasoline in the city of _____ has been volatile but remains at price levels above $3.00 per gallon; and

WHEREAS, the cost of electricity to recharge an electric vehicle is much cheaper than gasoline, the equivalent of paying $_____ per gallon of gasoline; and

WHEREAS, the market for electric vehicles in the United States, including the city of _____, has steadily increased since the introduction of commercially available models in 2011, and with new industry standards that ensure universal compatibility between vehicle manufacturers, more residents and businesses have purchased or have started to consider the purchase of an electric vehicle as a means of transportation; and

WHEREAS, electric vehicles need to be electrically recharged; and

WHEREAS, because the electric charging for private electric vehicles will take place mostly in residential settings, including those located in mixed-used districts and those without access to attached garages, allowing and defining regulations for an electric vehicle charging infrastructure in these districts of the city of _____ is in the public interest; and

WHEREAS, because businesses in non-residential areas may want to install electric vehicle infrastructure for their business uses or for their clients and/or employees to use, allowing and defining regulations for an electric vehicle charging infrastructure in these districts of the city of _____ is in the public interest; and

WHEREAS, the development of an electric vehicle charging infrastructure and of related regulations will allow the residents and businesses of the city of _____ to have and use safe electric vehicle charging equipment at their place of residence and employment, will give the opportunity for commercial and industrial projects to provide electrical vehicle charging services to customers and employees, and will allow businesses to set up charging equipment to supply their electric vehicle fleets; and

WHEREAS, the development of an electric vehicle charging infrastructure will create jobs and foster economic growth as the automobile industry transitions to this technology because local retailers and contractors will be required to sell, install, maintain, and repair these electric vehicles and the charging equipment; and

WHEREAS, the development of zoning regulations related to electric vehicle charging will foster economic growth through streamlining the process of installing charging equipment with clear and definitive regulations related to electric vehicle charging equipment and the districts in which the use of such equipment is allowed; and

WHEREAS, the city of ____ is committed to increasing and improving the City's sustainability goals, including improving air quality by reducing pollutants, and making possible sustainable land use and transportation policies by incorporating development standards that are appropriate for urban uses; and

WHEREAS, it is in the best interest of the city of _____ to define terms related to electric vehicles and their charging infrastructure, to refine the definitions of "permitted accessory use and structure" in all zoning district regulations, and to refine regulations related thereto; and

WHEREAS, the City Council (OR ITS EQUIVALENT) adopts this Ordinance pursuant to its police power to provide for the public, health, safety, and welfare;

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF _____, as follows:

SECTION 1. Chapter ___, Definitions, of the Zoning Code of the City of _____, is hereby amended to read as set forth below.

"(4) *Automobile:* Any vehicle propelled by its own motor and operating on ordinary roads. As used herein, the term includes passenger cars, trucks, motorcycles, motor scooters, motorized bicycles and the like. For purposes of this part, classes of automobiles may be separately controlled or regulated (as for example passenger cars, trucks and motorcycles).

(a) *Battery electric vehicle (BEV)*: Any motor vehicle that operates exclusively on electrical energy from an off-board source that is stored in the vehicle's battery, and produces zero tailpipe emissions or pollution when stationary or operating.

(b) *Electric vehicle*: Any motor vehicle that is licensed and registered to operate on public and private highways, roads, and streets, and operates either partially or exclusively on electrical energy from the grid, or an off-board source, that is stored on-board for motive purpose. Electric vehicle includes battery electric vehicles and plug-in hybrid electric vehicles.

(c) *Plug-in hybrid electric vehicle (PHEV)*: An electric vehicle that (1) contains an internal combustion engine and also allows power to be delivered to drive wheels by an electric motor; (2) charges its battery primarily by connecting to the grid or other off-board electrical source; (3) may additionally be able to sustain battery charge using an on-board internal-combustion-driven generator; and (4) has the ability to travel powered by electricity.

…

(14)(c) *Service station:* An establishment where gasoline, oil, grease, batteries, tires and automobile accessories may be supplied and dispensed at retail, and in connection with which is performed general automotive servicing as distinguished from automotive repairs. Battery exchange stations as defined in this section shall be construed as a service station.

…

(56) *Alternative fuel vehicle charging station:* A place or area which enables a vehicle to refuel itself with non-gasoline and non-diesel alternative fuels. Alternative fuels include pure methanol, denatured ethanol, and other

alcohols; mixtures containing 85 percent or more by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels (including E85 and M85); natural gas and liquid fuels domestically produced from natural gas (including compressed natural gas and liquefied natural gas); liquefied petroleum gas (including propane); hydrogen; biodiesel (B100); fuels other than alcohol derived from biological materials; electricity (including electricity from solar energy); P-series fuels; and any other fuel the United States Secretary of Energy determines by rule is substantially not petroleum and would yield substantial energy security benefits and substantial environmental benefits.
(a) *Electric vehicle charging station*: A public or private parking space that is served by electric vehicle supply equipment that has as its primary purpose the transfer of electric energy (by conductive or inductive means) to a battery in an electric vehicle.

(b) *Electric vehicle charging station — restricted use*: An electric vehicle charging station that is (1) privately owned and restricted access (e.g., single-family home, designated employee parking) or (2) publicly owned and restricted (e.g., fleet parking with no access to the general public).

(c) *Electric vehicle charging station — public use*: An electric vehicle charging station that is (1) publicly owned and publicly available (e.g., on-street parking and city-owned parking facilities) or (2) privately owned and publicly available (e.g., shopping center parking, non-reserved parking in multi-family parking lots).

(d) *Charging*: When the connector from an electric vehicle supply equipment (or standard outlet) is inserted into the electric vehicle inlet, and electrical power is being transferred for the purpose of recharging the batteries on board the electric vehicle.

(e) *Charging level*: The standardized indicators of electrical force, or voltage, at which an electric vehicle's battery is recharged.

1. Level 1 is considered slow charging, typically requiring a 15 or 20 amp breaker on a 120-volt AC circuit and standard outlet.

2. Level 2 is considered medium charging, typically requiring a 40 amp to 100 amp breaker on a 240-volt AC circuit.

3. DC Fast Charge is considered rapid charging, typically requiring a 60 amp or higher dedicated breaker on a 480-volt or higher three-phase circuit with special grounding equipment. DC Fast Charging uses an off-board charger to provide the AC to DC conversion, delivering AC directly to the car battery.

…
(80) *Electric vehicle infrastructure*: The structures, machinery, and equipment necessary and integral to support an electric vehicle, including the electrical conduit and premises wiring requirements for the installation of electric vehicle supply equipment, as well as battery exchange stations.

(81) *Electric vehicle supply equipment (EVSE)*: The conductors, including the ungrounded, grounded, and equipment grounding conductors and the electric vehicle conductors, attachment plugs, and all other fittings, devices, power

outlets, or apparatus installed specifically for purposes of delivering energy from the premises wiring to the electric vehicle, complying and conforming with National Electric Code Article 625 and Society of Automotive Engineers J1772 Standard.

(82) *Battery exchange station*: A facility where an electric vehicle with a swappable battery can enter and exchange its depleted battery with a fully charged battery through a fully automated process."

SECTION 2. The Zone District Regulations of the Zoning Code of the City of _____ are hereby amended to include electric vehicle charging stations as defined in section XXXX(56) that are equipped with Level 1 and Level 2 EVSE as a "permitted accessory use and structure" in all zoning districts.

SECTION 3. The Zone District Regulations of the Zoning Code of the City of _____ are hereby amended to include electric vehicle charging stations as defined in section XXXX(56) that are equipped with DC Fast Charge EVSE as a "permitted accessory use and structure" in the following districts: Residential General; Office-Institutional; Commercial; Industrial; Neighborhood Commercial; Live Work; Mixed Use Planned Developments; and Mixed Residential Commercial.

SECTION 4. The Zone District Regulations of the Zoning Code of the City of _____ are hereby amended to include electric vehicle charging stations as defined in section XXXX(56) that are equipped with EVSE as a "permitted principal use and structure" in the following districts: Commercial; Industrial; and Mixed Residential Commercial. If a parcel of land is to be used primarily for the retail electric charging of vehicles as a principal use and structure, then the use shall be equivalent to an automobile service station for zoning purposes, located only in zoning districts that permit service stations and subject to all rules and regulations applicable to automobile service stations.

SECTION 5. The Zone District Regulations of the Zoning Code of the City of _____ are hereby amended to include electric vehicle battery exchange stations as defined in section XXXX(82) as a "permitted principal use and structure" in the following districts: Commercial; Industrial; and Mixed Residential Commercial. Battery exchange stations are specifically prohibited in exclusively residential zones and Historic/Landmark districts.

SECTION 6. Section XXXX of the Zoning Code of the City of _____ is hereby amended to read as set forth below.

"No existing off-street parking or loading space, and no off-street parking or loading space hereafter provided, which meets all or part of the requirements for off-street parking or loading space set forth in these regulations, shall be reduced or eliminated by private action unless no longer required by these regulations, or unless alternative parking or loading space meeting requirements of these regulations is provided. Electric vehicle parking or charging station spaces are included and counted for minimum parking requirements as set forth in these regulations. For effect of reduction by public action, see section XXXX, 'Nonconforming characteristics of use.'"

SECTION 7. Section XXXX relating to Residential General districts of the Zoning Code of the City of _____ is hereby amended to read as set forth below.

"*Defined:* An off-street parking space is garage, carport or other uncovered off-street parking space, including electric vehicle charging stations, together with appropriate access and maneuvering ways."

SECTION 8. Section XXXX, Off-Street Parking Requirements, of the Code of Ordinances, City of Atlanta, Georgia, is hereby amended to read as set forth below.

"*Incentive program related to minimum off-street parking requirements – applicable to the conversion of parking spaces to or the new construction of electric vehicle parking and charging stations:* The City of is committed to becoming one of the top ten sustainable cities in the United States of America and supports the development of alternative fuel vehicle infrastructures. There is established an incentive program for the reduction in the number of car spaces and off-street parking spaces required in each zoning district to meet applicable minimum parking requirements, whereby each parking space that is converted to or is constructed newly as an electric vehicle parking space and/or an electric vehicle charging station, as defined in section XXXXXX, counts as three parking spaces toward meeting the off-street parking requirements as stated in these regulations. The incentive program is subject to the following limitations:

(a) The provisions of this section shall apply to any building, commercial establishment, or property for which a permit for new construction is issued following the effective date of this part, and to the alteration of existing buildings in all cases where sufficient space exists to provide such parking facilities.

(b) Electric vehicle parking spaces shall be reserved for the exclusive parking of an electric vehicle.

(c) Electric vehicle charging stations shall be reserved exclusively for the charging and parking of a vehicle that is connected to the EVSE for electric charging purposes.

(d) If the Department or board of zoning adjustment considers the incentive program to result in inadequate off-street parking for occupants, visitors, and/or employees considering the character or use of the building, the Department or board of zoning adjustment is hereby empowered to require a modification of the number of parking spaces that may be reduced pursuant to this section.

…
Other limitations on use of off-street parking and loading areas: No required unenclosed off-street parking and loading area shall be used for the sale, repair, dismantling or servicing of any vehicles, equipment, materials or supplies; and no other area on a lot shall be used for such purposes. The restrictions in this subsection do not apply to the electrical charging or servicing of electric vehicles in spaces equipped with EVSE or electric vehicle charging stations…"

SECTION 9. Chapter ___, General and Supplementary Regulations, of the Zoning Code the City of _____ is hereby amended by adding a new section, which section reads as set forth below.

"Section XXXX. - Design standards and other criteria for electric vehicle parking and charging facilities."

(1) The following design criteria apply to parking facilities offering electric vehicle parking and charging services for public use:

(a) Electric vehicle parking and charging stations, as defined in section XXXX(56), should be equal to parking space size and performance standards as provided in these regulations. The installation of an EVSE should not reduce the electric vehicle charging station's length to below off-street parking space size and standards required under Section XXXX.

(b) Where electric vehicle charging stations are provided:

(1) Installation of EVSE shall meet National Electric Code Article 625;

(2) Charging station outlets and connectors shall be no less than 36 inches and no higher than 48 inches from the surface where mounted;

(3) Equipment mounted on pedestals, lighting posts, bollards, or other device shall be designated and located as to not impede pedestrian travel or create trip hazards on sidewalks;

(4) Adequate electric vehicle charging station protection, such as concrete-filled steel bollards, should be used where warranted. Curbing may be used in lieu of bollards, if the battery charging station is setback a minimum of 24 inches from the face of the curb; and

(5) Adequate site lighting should be provided unless charging is for daytime purposes only. Higher lighting levels are encouraged to improve visibility of cables, charging equipment, and vehicle inlets.

(c) Way finding signs should be installed at the parking facility entrance and at appropriate decision points to effectively guide the motorists to the electric vehicle parking space and/or charging station.

(d) Each electric vehicle parking space and charging station shall be designated, clearly marked with appropriate signage indicating the space is an "electric vehicle reserved parking" or is an "electric vehicle charging station". If time limits or vehicle removal provisions are to be applied, regulatory signage including parking restrictions, hours and days of operations, towing, and contact information shall be installed immediately adjacent to, and visible from, the electric vehicle parking or charging station.

(e) Electric vehicle charging station should be maintained in all respects, including the functioning of the EVSE. A phone number or other contact information shall be provided on the equipment for reporting when it is not functioning or other problems are encountered.

(2) On-street electric vehicle charging stations.

(a) Where on-street parking spaces are designated and equipped to be electric vehicle charging stations, such spaces should be for the exclusive purpose of electric charging.

(b) Electric vehicle charging stations should be installed to use the last space on a block face in the direction of travel. Locating charging stations as such will reduce cable management issues and place the electric vehicle charging station closer to crosswalks and curb ramps.

(c) In parallel parking configurations, electric vehicle supply equipment should be installed near the front of the electric vehicle charging station based on the direction of travel.

(d) In perpendicular or angle parking configurations, electric vehicle supply equipment should be centered, or to the left, in front of the electric vehicle charging station for single connectors, and placed between two electric vehicle charging stations for dual connectors.

(e) When electric vehicle supply equipment is placed in a sidewalk or walkway adjacent to the on-street electric vehicle charging station, it should not interfere with the minimum pedestrian clearance widths as defined in Chapter 11B of the American Disability Act Standard.

(f) Retraction devices or a place to hang permanent cords and connectors when not in use sufficiently above the pedestrian surface should be provided. Cords, cables, and connector equipment should not extend across the path of travel within the sidewalk or walkway.

(3) Electric vehicle parking or charging structures as either principal or accessory use: In addition to Section XXXX relating to Parking Structures, the following regulations shall apply:

(a) When located immediately adjacent to any public right-of-way, public park, private street, or adjacent R-1 through R-5, RLC, R-G, MR, or PD-H District:

(1) Shall be delineated to, and including, the third story above the sidewalk-level executed through windows, belt courses, cornice lines or similar architectural detailing and shall conceal automobiles from view. Said structure shall have an appearance similar to that of the adjoining or attached residential, commercial or mixed-use structure.

(2) Parking structure façades shall have openings screened with mesh or decorative panels, tinted or sandblasted glass, or similar screening elements so as to prevent views into the parking structure.

(3) Parking decks shall be illuminated with uplighting or shall contain shielded internal light bulbs to eliminate light spillage outside the structure.

(b) Along all façades not along any public right-of-way, public park, or private street, a continuous landscaped strip between the structure and property line should be planted as follows:

(1) As to not impede visibility within visibility triangles at street intersections, as measured from the curb, between the heights of two and one-half feet and eight feet above grade; otherwise, a continuous minimum

five feet wide landscaped strip shall be provided between the structure and the public sidewalk, except at ingress and egress points into the structure. Said landscaped strip shall be planted with street trees spaced a maximum distance of 20 feet on center. The landscape strip shall also be planted with evergreen ground cover such as mondo grass, liriope spicata, ivy or evergreen shrubs with a maximum mature height of 24 inches. All plantings, planting replacement and planting removal shall be approved by the city arborist.

(2) To meet an active-use depth requirement from said parking structure façade at sidewalk-level, except at ingress and egress points into said parking structures. When two or more floors meeting the definition of sidewalk-level exist within the same building, this requirement shall only apply to the frontage of each floor located within five vertical feet above or below the grade of the adjacent sidewalk. For the purposes of this chapter active uses shall be serviced by plumbing, heating, and electricity and are limited to residential, retail, eating and drinking establishments, museum, gallery, office, institutional, auditorium, library, hotel lobby, or cultural facility uses, and shall not include parking, non-residential storage areas, driveway or queuing lanes parallel to the adjacent street. Minimum active-use depths shall be provided as follows:

(i) Residential uses: Minimum depth of ten feet.

(ii) All other uses (as specified above): Minimum depth of 20 feet.

(4) Signage

(a) All signage must comply with the Sign Ordinance of the City .

(b) Placement and Clearances:

(1) Signs should be no smaller than 12”W x 18”H

(2) Bottom of sign shall be 7’ above ground.

(3) Poles shall be located from 24” from the curb.

(4) Signs shall not be hidden by other signs or objects.

(5) Intersections: Signs may be no closer than 20’ from the closest edge of a cross walk or 30’ from the corner of an intersection if no cross walk exists.

(6) Fire Hydrant: Signs may be placed 15’ from either side of a fire hydrant.

(7) Driveway/Curb Cur: Signs may be placed 10’ from a driveway/curb cut.

(8) ADA: signs shall not be placed within 48” of another pole.

(c) Sign Installation

(1) Signs to be placed and installed within right-of-way must comply with Section XXX.

(2) Where possible, signs shall be attached to light poles or u-channel poles.

(3) If existing poles to do not correlate with the placement of the EVSE, new u-channel poles shall be installed. Other signs that are not location-sensitive will be moved to the new pole.

(4) Signs shall not be adhered to wooden poles, trees, or way-finding signs.

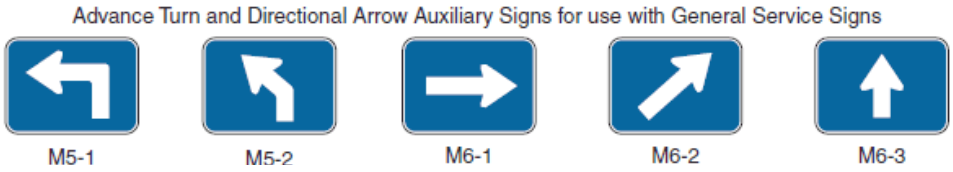
(5) If 2 or more signs exist on the same pole, then parking restriction signs (red) shall be placed above general service signs or regulatory signs (green).

(6) If 2 or more signs exist on the same pole, then parking restriction signs (red) shall include a 6”x12” sign with a RED arrow indicating where the restriction applies with respect to the sign.

(7) Way-finding signs associated with EVSE general service signs will utilize WHITE arrows with BLUE background unless otherwise directed by the City of .

(d) Examples of Signs

(1) Way-finding Signs



(2) General Service Signs

(3) Regulatory Signage

i. EV Parking Only

ii. EV Charging Only

(4) Striping

(5) Minimum landscaping requirements for surface electric vehicle parking and charging station lots. The requirements of City Code of Ordinances, chapter ____ vegetation, article II, tree protection, section XX, parking lot requirements, shall apply to electric vehicle parking and charging station lots in addition to the street tree planting requirements, with additional requirements as follows:

(a) Said surface parking lot requirements shall apply to all lots regardless of size;

(b) Existing parking lots shall not be required to reduce the number of parking spaces by more than three percent as a result of implementing the following surface parking lot landscaping regulations:

(1) All parking bays shall be terminated with a landscape strip a minimum width of five feet and equal to the length of the parking bay.

(2) All required landscaped areas shall be planted with evergreen groundcover or shrubs with a maximum mature height of 30 inches; and

(3) All required landscaped buffer strips, regardless of length, shall have a minimum of one tree planted per 30 feet of length with a minimum caliper of two and one-half inches."

SECTION 10. All Ordinances or parts of Ordinances in conflict herewith are hereby repealed only to the extent necessary to give this Ordinance full force and effect.

SECTION 11. If any section, clause, or provision of this Ordinance shall be declared to be unconstitutional, void, illegal, or ineffective by any court of competent jurisdiction, such section, clause, or provision declared unconstitutional, void, or illegal shall thereby cease to be a part of this Ordinance, but the remainder of this Ordinance shall stand and be in full force and effect.

SECTION 12. The proceedings pending and all rights and liabilities existing, acquired, or incurred at the time this Ordinance takes effect are saved and may be consummated according to the law when they were commenced.

SECTION 13. The provisions of this Ordinance are hereby ordered to take effect upon the publication in the manner prescribed by the Charter of the City of _____.

SECTION 14. This Ordinance is hereby declared to have been adopted by the City Council of the City of _____, at a meeting thereof duly called and held on _____ day of _____, 20__, and ordered to be given publication in a manner prescribed by the Charter of the City of _____.

Section 3.4.3 – Model Traffic Ordinance

EXECUTIVE SUMMARY

The proposed ordinance will amend the traffic and road rules of the City Code by adding language to:

(a) Authorize designated stalls or spaces in any parking facility owned or operated by the City for the exclusive purpose of parking electric vehicles.

(b) Authorize designated stalls or spaces equipped with an EVSE in any parking facility owned or operated by the City for the exclusive purpose of charging and parking an electric vehicle that is connected for electric charging purposes.

(c) Authorize removal of a vehicle (after notification to police) parked in a designated EV parking or charging space where the vehicle is not connected for electric charging purposes.

(d) Requiring sign posting warning that unauthorized vehicles not connected for electric charging purposes to be towed away at the owner's expense.

(e) Prohibit a person from parking or leaving standing a vehicle in a designated EV parking or charging space unless the vehicle is connected for electric charging purposes.

(f) Prohibit a person from obstructing, blocking, or otherwise barring access to designated stall.

(g) Setting penalty for violations upon conviction of $75.

A MODEL ORDINANCE RELATING TO THE DEVELOPMENT AN ELECTRIC VEHICLE CHARGING INFRASTRUCTURE, AMENDING THE TRAFFIC CODE TO DEFINE TERMS AND REGULATIONS RELATED TO SPACES RESERVED FOR ELECTRIC VEHICLE PARKING AND CHARGING ONLY.

[RECITALS should be included to explain the need to develop and adopt this model ordinance, such as:

WHEREAS, the City of _____ has taken actions to update its zoning code to develop the City's electric vehicle charging infrastructure by allowing the use of electric vehicle supply equipment throughout the City's zoning districts, with limitations where appropriate; and

WHEREAS, certain incentives proposed by the City of _____ to promote electric vehicle adoption require regulations and enforcement mechanisms to be implemented in order to achieve the intended goals of the policies to develop the City's electric vehicle charging infrastructure…]

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL [or its equivalent] OF THE CITY OF _____, as follows:

SECTION 1. Electric vehicle parking and charging places.

(a) Electric vehicles may park in any space designated for public parking, subject to the restrictions that would apply to any other vehicle that would park in that space.

(b) The Director of Public Works is authorized to designate stalls or spaces in any parking facility owned or operated by the City or any on-street parking space for the exclusive purpose of parking an electric vehicle.

(c) The Director of Public Works is authorized to equip electric vehicle parking stalls or spaces with EVSE in any parking facility owned or operated by the City or any of its on-street parking spaces for the exclusive purpose of charging and parking a vehicle that is connected for electric charging purposes.

(d) Parking stalls or spaces marked as "electric vehicle parking space" are exclusively reserved for the parking of an electric vehicle.

(e) Parking stalls or spaces equipped with EVSE are reserved exclusively for the charging and parking of a vehicle that is connected for electric charging purposes. These stalls or spaces shall be marked as "electric vehicle charging stations."

(f) At the direction of the Director, the City Public Works Engineer shall cause appropriate signs and markings to be placed in and around spaces designated and reserved for electric vehicle parking, indicating prominently thereon the parking regulations. The signs shall define time limits, as applicable, and shall state that the parking space is reserved for electric vehicles only.

SECTION 2. Notification and Signage.

(a) At the direction of the Director, the City Public Works Engineer shall cause appropriate signs and marking to be placed in and around electric vehicle charging station, indicating prominently thereon the parking regulations. The signs shall identify the voltage and amperage levels; define time limits, fees, and hours of operation, as applicable; and state that the charging station space is reserved for charging purposes only, which is to be defined as occurring when a vehicle is connected to the EVSE for electric charging purposes.

(b) Parking signage related to electric vehicle parking and charging stations in public parking facilities or on public roads shall accurately reflect the City's Code of Ordinances provisions as applied to days and times of parking enforcement under City Code sections XXXX. If there is a conflict between on-street parking signage and associated electric vehicle parking spaces and charging stations with respect to days, hours of enforcement, and/or maximum parking times, the information contained in the parking signage shall apply.

SECTION 3. Prohibitions.

(a) When a sign authorized under Section 2 above provides notice that a space is designated as electric vehicle parking or an electric vehicle charging station, no person shall stop, stand, or park any non-electric vehicle, or otherwise block access to parking, in any such designated parking space or charging station.

(b) When a sign authorized under Section 2 above provides notice that a space is designated as electric vehicle charging station, it is unlawful to park or permit to be parked any vehicle, including an electric vehicle, if such electric vehicle is not in the process of charging.

(c) Only one electric vehicle should occupy any space marked as an electric vehicle parking space or charging station, and no person should park except within the boundaries of the space defined.

SECTION 4. Enforcement.

(a) Electric vehicle parking spaces and charging stations shall be enforced by any police officer, parking enforcement officer, or parking management service, as defined in Code section XXXX.

(b) Violations of this chapter shall be punishable in accordance with Code sections XXXX. Each day such violation is committed shall constitute a separate offense and shall be punishable as such.

(c) In addition to a fine, a person who has parked or left a vehicle standing upon a street, alley, or City parking lot or garage in violation of this paragraph is subject to having the vehicle removed from the street, alley, or City parking lot or garage in accordance to Code section XXXX.

(d) If removal provisions are to be enforced by the property owner, such action must be in accordance to the procedures to abate a nuisance."

Section 3.4.2 – Model Ordinance for Per Session Fee Charge

MODEL ORDINANCE RELATING TO THE DEVELOPMENT OF AN ELECTRIC VEHICLE CHARGING INFRASTRUCTURE, AUTHORIZING A PER-SESSION FEE FOR ELECTRIC CHARGING PURPOSES TO BE CHARGED AT CITY-OWNED OR OPERATED ELECTRIC VEHICLE CHARGING STATIONS; AUTHORIZING THE COMMISSIONER OF PUBLIC WORKS TO SET THE PER-SESSION FEE; AND DEFINING GUIDELINES FOR DETERMINING THE AMOUNT OF AND THE ANNUAL REVIEW OF THE PER-SESSION FEE.

[RECITALS should be included to explain the need to develop and adopt this model ordinance]

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL [or its equivalent] OF THE CITY OF _____, as follows:

SECTION 1. Public Electric Vehicle Charging Station Per-Session Use Fee Rates – authority to set.

The Commissioner of Public Works is authorized to set rates for publicly available electric vehicle charging stations, as defined in Section XXXX, in parking facilities owned or controlled by the City of _____.

SECTION 2. Public Electric Vehicle Charging Station Per-Session Use Fee Rates – guidelines.

(a) A per-session fee for public use of electric vehicle charging stations in parking facilities owned or controlled by the City of _____ shall be set based on expected operation costs and expected vehicle charging station use. For the purpose of this subsection, "operation costs" shall include electricity costs related to the charging stations, and may include the department of public works' cost of planning and administration, fees charged by vendors for management services and routine maintenance of the charging stations, facility enforcement costs, and other reasonable costs associated with the electric vehicle charging station operations.

(b) The Commissioner of Public Works shall consult with the Office of Sustainability and the Department of Finance to identify a single per-session electric vehicle charging fee to be used at all City-owned or operated electric vehicle charging stations that is no higher than $4.00 per session (Maximum electric vehicle charging station per-session fee) and, when charging fees are in effect, no lower than $1.50 per session (Minimum electric vehicle charging station per-session fee). The Commissioner is authorized to set the electric vehicle public charging use fee at the level identified during the consultation. All electric vehicle charging station fees will be in addition to general parking fees and inclusive of any taxes. After MONTH 20XX, the Commissioner of public works is authorized to set electric vehicle charging station fees without regard to the maximum and minimum electric vehicle charging per-session fee set forth in this subsection.

SECTION 3. Public Electric Vehicle Charging Station Per-Session Use Fee Rates – report.

The Commissioner of Public Works, the Office of Sustainability; and the Department of Finance will gather data on the use and costs of electric vehicle charging stations. By MONTH 20XX, the directors will provide a report to the Council

addressing the use of the charging stations, City operations, and maintenance costs for the stations, revenue obtained from the charging stations, and the customer experience in using the stations. If warranted, the report also will include recommendation to change fees, or the range of fees, to improve customer service and recover City costs.

SECTION 4. Public Electric Vehicle Charging Station Per-Session Use Fee Rates – penalties.

The base monetary penalty for violation of the provision related to electric vehicle charging station shall be in accordance to those set in section XXXX

Section 3.4.1 – Model Building Ordinance

A MODEL ORDINANCE RELATING TO THE DEVELOPMENT OF AN ELECTRIC VEHICLE CHARGING INFRASTRUCTURE, AMENDING THE BUILDING CODE TO REQUIRE ELECTRICAL CONDUIT/CABLE RACEWAY READINESS; TO SET INSTALLATION AND PROCESS REVIEW REGULATIONS RELATED THERETO; TO REQUIRE MINIMUM ELECTRIC VEHICLE PARKING REQUIREMENTS IN CERTAIN PARKING FACILITIES; AND TO SET DESIGN STANDARDS FOR ON-STREET ELECTRIC VEHICLE CHARGING STATIONS.

[RECITALS should be included to explain the need to develop and adopt this model ordinance.]

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL [or its equivalent] **OF THE CITY _____**, as follows:

SECTION 1. Electric vehicle charging infrastructure readiness requirement.

(a) All new construction, both residential and non-residential, are required to include electric vehicle charging infrastructure readiness plans to accommodate the future hardwire installation of EVSE in or near parking areas. Electric vehicle charging infrastructure means space, electrical conduit or cable raceway, electrical banks, and access points.

(1) For single-family and multi-family residential projects, the electric vehicle charging infrastructure shall extend to all parking spaces in a residential building.

(2) For the non-residential portion of mixed-use buildings, as well as for commercial and retail facilities, the electric vehicle charging infrastructure should extend as follows:

Total Number of Parking Spaces	Number of Required Spaces
10-25	2
26-50	4
51-75	6
76-100	8
101-150	11
151-200	16
201 and over	At least 8 percent of total

.

(b) Electric conduit or cable raceways installed pursuant to subsection (a) shall be of sufficient size to hold electrical wiring as necessary depending on size of parking area, but should be no less than trade size 1. Any electrical conduit shall be securely fastened at the main service or subpanel and shall terminate in close proximity to the proposed location of the charging equipment in a listed cabinet, box, or enclosure. All cable raceways are required to be continuous at enclosed or concealed areas and spaces. For residential projects, a cable raceway may terminate in an

attic or other approved location when it can be demonstrated that the area is accessible and no removal of materials is necessary to complete the final installation.

(c) All new single-family and multi-family residential dwellings with garages or adjacent, off-street parking are required to be constructed to provide a 220-240 volt/40 amp outlet on a dedicated branch circuit and in close proximity to the designated vehicle parking area to accommodate the potential future hardwire installation of EVSE.

(d) All new and expanded non-residential development parking facilities are required to provide the electric capacity to accommodate the future hardwire installation of charging stations, including a receptacle to accommodate use by EVSE. Site design and plans must include the location(s) and type of conduit or raceway method(s), wiring schematics (if any), and electrical calculations to verify that the electrical system has sufficient capacity to simultaneously charge all future electric vehicle charging stations at a minimum of Level 2 charging levels.

(e) The electrical room in a multi-family building, or in the multi-family component of a mixed-use building, must include sufficient space for the future installation of electric equipment necessary to provide a receptacle to accommodate use by EVSE for 100 percent of the parking stalls that are used by owners or occupiers of the building or of the residential component of the building.

SECTION 2. Installation and process of review.

(a) Installation of a charging station associated with the construction of a new residential or non-residential property shall be processed in association with the underlying permit(s).

(b) Installation of a charging station associated with the retrofitting of a single-family home shall require an electrical permit if the installation requires setting up a 220-240 volt/40 amp outlet on a dedicated circuit.

(c) Retrofitting a commercial site, multifamily residential or community site in a residential land division requires an electrical permit and an applicant to submit a site plan showing the location and scope of the proposal. The Director of Community Development will use the site plan to determine if the retrofitting for a charging station(s) in an existing commercial, multifamily, or community site in a residential land division could significantly impact parking, landscaping, signing, drainage, or other public interest concerns. If the Director of Community Development determines a retrofit will not adversely impact any issues of public interest, the electrical permit will be issued and the retrofitting may proceed. If the retrofitting is determined to adversely impact issues of public interest, then the proposal will be reviewed and must be approved by the City's Site Plan Review process prior to issuing of the electrical permit.

(d) If a facility includes a battery exchange station, an application for an electrical permit shall require review and approval by the City's General Plan and Site Plan Review process.

SECTION 3. Minimum electric vehicle charging station requirements.

(a) All parking facilities, including public, private, and government parking facilities, that are available for use by the general public and have at least one hundred parking spaces available for public accommodation shall designate the minimum number of parking spaces required in Table 16-XXX exclusively for electric vehicles by MONTH 20XX.

(b) Where parking facilities are required to designate electric vehicle parking spaces in accordance with subsection (a), at least one of the electric vehicle spaces shall be equipped with an electric vehicle charging station by MONTH 20XX.

(c) Owners of multiple parking lots within the city of Atlanta may designate and electrify fewer parking spaces than required in one or more of their owned properties as long as the scheduled requirements of subsections (a) and (b) are met for the total number of aggregate spaces on all of their owned properties.

SECTION 4. On-street electric vehicle charging stations – General Design Standards.

(a) Where on-street parking spaces are designated and equipped to be electric vehicle charging stations, such spaces are for the exclusive purpose of electric vehicle charging.

(b) Electric vehicle charging stations should be installed to use the last space on a block face in the direction of travel. Locating charging stations as such will reduce cable management issues and place the electric vehicle charging station closer to crosswalks and curb ramps.

(c) In parallel parking configurations, electric vehicle supply equipment should be installed near the front of the electric vehicle charging station based on the direction of travel.

(d) In perpendicular or angle parking configurations, electric vehicle supply equipment should be centered, or to the left, in front of the electric vehicle charging station for single connectors, and placed between two electric vehicle charging stations for dual connectors.

(e) When electric vehicle supply equipment is placed in a sidewalk or walkway adjacent to the on-street electric vehicle charging station, it should not interfere with the minimum pedestrian clearance widths as defined in Chapter 11B of the American Disability Act Standard. Cords, cables, and connector equipment should not extend across the path of travel within the sidewalk or walkway.

(f) Retraction devices or a place to hang permanent cords and connectors when not in use sufficiently above the pedestrian surface should be provided.

Section 3.3.8 – Case Study – Clemson Area Transit (Transit Facility)

Clemson Area Transit installed their first public PEV charging station on June 24, 2011 in the facility's staff/guest parking lot.

Electric Vehicle Support Equipment Information

Type(s) of Unit(s)	Single Pedestal EVSRN3 208-240V/30A 1 phase
Model	NEMA 3R
Manufacturer	General Electric
Number of Units	2
Contact	NA

Ongoing Unit Management Company and Responsibility (Who is responsible for ongoing maintenance and paying for the electricity?):

H & W Electrical is responsible for ongoing maintenance, and Clemson Area Transit/City of Clemson pays for the electricity (note: CAT has solar panels on the roof of its facility to offset electricity cost).

Who funded the project? (Example: owner funded, DOE funded, etc)

The IT portion of the American Recovery and Reinvestment Act (ARRA)

Information about the units installed and why these were chosen for this location:

GE was advertising a new sleek design (WattStation), which was not available at the time we needed to purchase, but we were able to negotiate an even change with the present models when the new ones came out. Design and price were the top considerations in choosing a charging station.

Installation Information

Start date	June 23, 2011
Completion date	June 24, 2011
Consultant (if applicable)	Brian Edens
Installer	Thurso Power Systems, LLC
Contractor	Alan Holcomb, H & W Electrical (864-233-7227)

Description of signage:

A sign stating "Electric Vehicle Parking" was posted by each of the EV chargers.

Parking information (Will there be a fee for parking? Will there be a fee for charging? If so what rate/method):

There is no fee for parking or charging. CAT is a fare-free system and wants to encourage as many "green" options for transportation as possible.

Information about the installation process (barriers to success, achievements, unique issues that were overcome):

There were no issues with installation because the EV units were designed in tandem with the new facility.

Who are the expected consumers? How often do you expect charging to occur?

CAT expects Clemson University students and professors to use the charging stations as well as the general public. At this point there are very few vehicles powered exclusively by electricity thus very limited usage of the charges.


ELECTRIC
VEHICLE
PARKING


ELECTRIC
VEHICLE
PARKING

Section 3.3.7 – Case Study – Atlanta (Residential)

Stephen Taylor installed EVSE in his home in Atlanta, Georgia, as well as solar panels to offset electricity demand.

EVSE Installation Process:

Step 1: Buy a unit from Clipper Creek
Step 2: Buy a range cord from Lowes and wire it into the Clipper Creek EVSE.
Step 3: Plug it into one of the 2 NEMA 14-50 outlets I already have in my garage.

Stephen uses the Tesla EVSE that came with his PEV and is capable of pulling 70 amps at 240 volts or almost 17 kW. A private electrician installed a 100-amp breaker in his panel, ran the line into the garage and mounted the EVSE.

Offsetting electricity demand with solar panels:

A company that is no longer in the business installed the old solar panels, and the newer solar panels were installed by Solar Energy USA (based in Alpharetta, GA). The old panels consist of 80 75-watt (6000 watts) panels feeding 2 inverters. The newest fixed array consists of 28 240-watt panels (6720 watts), and the tracking system consists of 12 230-watt panels (2760 watts).

Section 3.3.6 – Case Study – Acworth (Residential)

Christian Beauregard installed his first PEV charging station on May 11, 2012 in his home in Acworth, Georgia.

Electric Vehicle Support Equipment Information

Type(s) of Unit(s)	Level 2, 240V/25 amp with J1772
Model	Clipper Creek LCS-25
Manufacturer	Clipper Creek
Number of Units	1
Contact	greg@metroplugin.com

Installation Information

Start date	May 11, 2012
Completion date	May 11, 2012
Consultant (if applicable)	N/A
Installer	Pat Murphy Electric
Contractor	

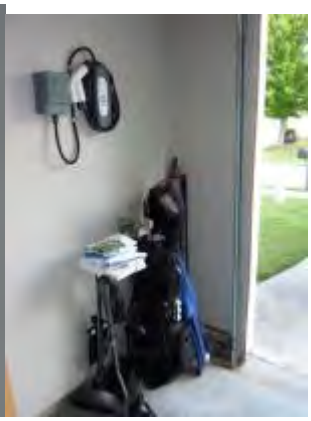
Information about the installation process (barriers to success, achievements, unique issues that were overcome):

The charging station provider recommended by Nissan, which is also taking care of arranging the installation, sent a retired electrician to survey the installation. After discussing my requirements, the original plan was to mount the charging station on the outside of the house because the Leaf would be parked in our driveway. It was determined that we could not mount it directly to our vinyl siding. I decided to put in a post and mount the charger on the post.

The project required HOA approval. I had to provide a schematic, along with an explanation, of the proposed installation to our HOA for approval. The plan was to install a 4" X 4" pressure treated post, 5 feet high, about 4 inches away from the outside front corner of the garage, and mount the charging station 4 feet from the ground. The post would be covered by a vinyl sleeve and cap, for better aesthetics. It took about 3 weeks to receive a written confirmation of the approval.

The recommended charging station provider gave us an estimate of $1,500 for the installation alone, which I thought too expensive. We contacted Metro Plug-In who came out to the house and suggested we mount it inside the garage as the cable has more than enough length to reach a car in the driveway. Together we solved the issue of the cable traveling underneath the garage door – it needed a new seal and some minor adjustment in the stopping point. The total cost of this installation was less than $700 and that included an upgrade to 40-amp wire for future upgrade.

Southeast Regional EV Readiness Workbook



Section 3.3.5 – Case Study – UPS (Employer)

UPS installed a public PEV charging station in April 2012 in their employee parking garage.

Electric Vehicle Support Equipment Information

Type(s) of Unit(s)	240 volt level-2
Model	LCS-25
Manufacturer	Clipper Creek
Number of Units	1
Contact	Greg Crittenden

Ongoing Unit Management Company and Responsibility (Who is responsible for ongoing maintenance and paying for the electricity?):

United Parcel Service (UPS)

Who funded the project?

UPS

Information about the units installed and why these were chosen for this location:

The units were chosen at this location to allow employees to charge at their workplace.

Did you prepare a plot plan for this installation? If so please provide supporting documentation that outlines the technical specifications of the EVSE installation.

The units were installed at a standard parking spot in their employee parking garage.

Installation Information

Start date	April 2012
Completion date	N/A
Consultant (if applicable)	Gary Daniels (770-318-3459)
Installer	Ace Electrical (770-971-8767)
Contractor	Ace Electrical

Southeast Regional EV Readiness Workbook

Section 3.3.4 – Case Study – Kirk-Rudy (Employment Center)

Overview:

- Kirk-Rudy, a Green and Sustainability-oriented company, commissioned a Solar Parking Canopy with one EV charging station for the use of their employees and visitors.
- 100 kW Photovoltaic (PV) canopy (475 feet long); 432 solar panels; 12 inverters; shade for 50 parking spots.
- Cost: in excess of $500,000 with investment payback expected to be 3.5 years.
- Parking canopy structurally easier to install than rooftop - less maintenance overall.
- Set up with Feed-In Tariff to GA Power at $0.17/kWh.
- Tied directly to power grid w/ no tie-in to facility. This is a GA Power requirement for Feed-In Tariff. KR gets credit in the form of a monthly check intended to offset their electricity bill.
- The EVCS is a 208 Volt / 40 amp unit. Provides 6.6 kW of charging power. Connected directly to the facility's electrical system (behind the meter) and does not interface with the solar panel array at all. This is for the following reasons:
    - Feed-In Tariff requires the solar array to be completely isolated from all loads. In essence, this is a dedicated power station for GA Power.
    - Connecting the EVCS the grid is far cheaper than installing a battery back-up system for times of non-solar production.

Major Issues Encountered:

- Erroneous Plot Plans:
    - An erroneous plot plan incorrectly showed a large water drainpipe six feet south of actual position.
    - Pipe was damaged during footer drilling. Extensive time and cost required for repairs.
- Permitting:
    - Permitting offices were not sure how to classify parking canopy with solar PV panels.
- Inspections:
    - Inspectors were generally unfamiliar with solar and EV charging station installations. We had to identify the various components, explain their function, and educate them on code requirements.
- Electric Vehicle Charging Station:
    - The original contract called for a 100 amp charging station. During the electrical installation phase of construction it was discovered the facility's electric service could not handle the 100-amp load without installing another transformer – an expensive solution and not covered by GA Power.
    - The EVCS was swapped out for a 40 amp charging station.

Southeast Regional EV Readiness Workbook



Section 3.3.3 – Case Study – Hilton Garden Inn (Hospitality)

Hilton Garden Inn installed their 1st public PEV charging stations on September 6th 2011 in the parking lot located at 3045 Windy Hill Rd. Atlanta GA. 30339. Eric Gray, General Manager with Hilton Garden Inn.

Electric Vehicle Support Equipment Information

Type(s) of Unit(s)	Pedestal Mount DuraStations Level 2
Model	
Manufacturer	General Electric
Number of Units	2
Contact	Chris Crawford

Ongoing Unit Management Company and Responsibility (Who is responsible for ongoing maintenance and paying for the electricity?):

Hilton Garden Inn will be responsible for providing the electricity and routine maintenance. Cole Technology will be responsible for any warranty issues (Cole also can provide for a fee routine maintenance).

Information about the units installed and why these were chosen for this location:

Installed two pedestal mounted DuraStations. These stations are both level 2 stations with the SAE approved J1772 connector.

Did you prepare a plot plan for this installation? If so please provide supporting documentation that outlines the technical specifications of the EVSE installation.

There was not a plot plan developed for this installation.

Installation Information

Start date	September 6, 2011
Completion date	October 10, 2011
Consultant (if applicable)	N/A
Installer	Cole Technology Inc. (404-472-1213)
Contractor	Ken Adams, Cole Technology Inc. (404-472-1213)

Description of signage:

Green and white "Reserved Parking Electric Vehicles Only"

Parking information (Will there be a fee for parking? Will there be a fee for charging? If so what rate/method):

Currently there is no fee for parking and from my understanding there are no plans for a fee in the future.

Information about the installation process (barriers to success, achievements, unique issues that were overcome):

The installation did not pose any significant obstacles. Although the location chosen for the stations was across the parking lot from the building so power had to run underground for approximately 125 feet. We accomplished this using a boring

machine to bore under the drive and lot so as not to disrupt the driveway and parking area. We installed two bollards for protection against impact from automobiles.

Section 3.3.2 – Case Study – Georgia Tech (Parking Garage)

Georgia Tech installed its first public PEV charging station on December 5, 2011 in the Georgia Tech Hotel and Conference Center parking deck located at 806 Spring St. NW in Atlanta.

This installation currently supports 2 vehicles charging at 220v (Level II) and uses a payment system designed by Recharge Solutions Int'l, LLC. These public chargers will be available to the University's faculty, students and visitors 24/7. Users can register for short or long term charging and pay by credit card on an hourly or monthly basis.

The Recharge Solutions Electric Vehicle Charging System is the only electric vehicle charger that is specifically designed for multi-level garages. It is scalable so that it can be expanded as additional demand develops and is the most technologically advanced electric vehicle charging system in the United States.

Recharge Solutions is also working on a private 110v (Level I) charging implementation in this same parking deck to support Georgia Techs growing fleet of PEVs. This fleet system will enable the University to effectively monitor the usage and costs of its electric vehicle fleet.

White Electrical Construction, Inc. accomplished the physical installation for both systems on a sub contract with Recharge Solutions. The installation took about 2 months from initial project kickoff to the Grand Opening on December 5th. This is the pilot installation for Recharge Solutions and most of the installation time was spent testing and debugging their software systems.

Aaron Fowler is the Alternative Transportation Coordinator for the Georgia Tech Department of Parking and Transportation and can be reached at 404-385-6030 or aaron.fowler@parking.gatech.edu.

Vince Wood is the contact for White Electrical Construction, Inc. and can be reached at 404-925-1687.

Section 3.3.1 – Case Study – Atlantic Station (Commercial)

CB Richard Ellis Investors opened Atlanta's first public EV charging station on August 31, 2011 in Atlantic Station (on 17th Street across from the Millennium Gate).

Electric Vehicle Support Equipment Information

Type(s) of Unit(s)	240 volt level-2
Model	CS
Manufacturer	Clipper Creek
Number of Units	
Contact	Greg Crittenden

Ongoing Unit Management Company and Responsibility (Who is responsible for ongoing maintenance and paying for the electricity?):

CB Richard Ellis (CBRE)

Who funded the project? (Example: owner funded, DOE funded, etc)

CBRE

Information about the units installed and why these were chosen for this location:

The units were chosen at this location to provide convenience to visitors of Atlantic Station.

Did you prepare a plot plan for this installation? If so, please provide supporting documentation that outlines the technical specifications of the EVSE installation.

The units were designed to be a part of a solar canopy

Installation Information

Start date	N/A
Completion date	N/A
Consultant (if applicable)	Gary Daniels (770-318-3459)
Installer	Ace Electrical (770-971-8767)
Contractor	Ace Electrical

Description of signage:

"The Charging Spot" posted on backboard behind chargers

Parking information (Will there be a fee for parking? Will there be a fee for charging? If so what rate/method):

Fee for parking

Information about the installation process (barriers to success, achievements, unique issues that were overcome):

The challenges were created by the installation and permitting of the solar canopy, no special circumstances surrounded the installation of the EV chargers

Who are the expected consumers? How often do you expect charging to occur?

Consumers are expected to be shoppers and restaurant visitors of Atlantic Station - Daily

3.2.10 Sample Signage Guide

The following list describes some of the step and activities you may need to follow in order to create and install signage for charging stations and EV parking. The specifications provided are included as examples only. It is important to note that requirements may vary by jurisdiction—it is your responsibility to comply with all applicable federal, state, and local regulations.

1. Placement and Clearances:
    a. Signs should be no smaller than 12”W x 18”H
    b. Bottom of sign shall be 7’ above ground
    c. Poles shall be located from 24” from the curb
    d. Signs shall not be hidden by other signs or objects
    e. Intersections: Signs may be no closer than:
        i. 20’ from the closest edge of a cross walk or
        ii. 30’ from the corner of an intersection if no cross walk exists
    f. Fire Hydrant: Signs may be placed 15’ from either side of a fire hydrant
    g. Driveway/Curb: Signs may be placed 10’ from a driveway/curb cut
    h. ADA: signs shall not be placed within 48” of another pole
    i. Right-of-way considerations

2. Sign installation
    a. Where possible, signs shall be attached to City light poles or u-channel poles
    b. If existing poles do not correlate with the placement of the EVSE, new u-channel poles shall be installed; other signs that are not location-sensitive will be moved to the new pole
    c. Signs shall not be adhered to wooden poles, trees, or way-finding signs
    d. If two or more signs exist on the same pole, then parking restriction signs (red) shall be placed above general service signs or regulatory signs (green)
    e. If two or more signs exist on the same pole, then parking restriction signs (red) shall include a 6”x12” sign with a RED arrow indicating where the restriction applies with respect to the sign

Signage is an important component to raise awareness of EV infrastructure. The more people see the signage, the more aware they become, and consistent signage across the Tri-State region will further enhance familiarity. The following examples are suggested signage for use in the tri-state region.

Way-finding Signs

General Service Signs

EV Charging (MUTCD)[1]

Regulatory Signage

EV Parking Only

EV Charging Only

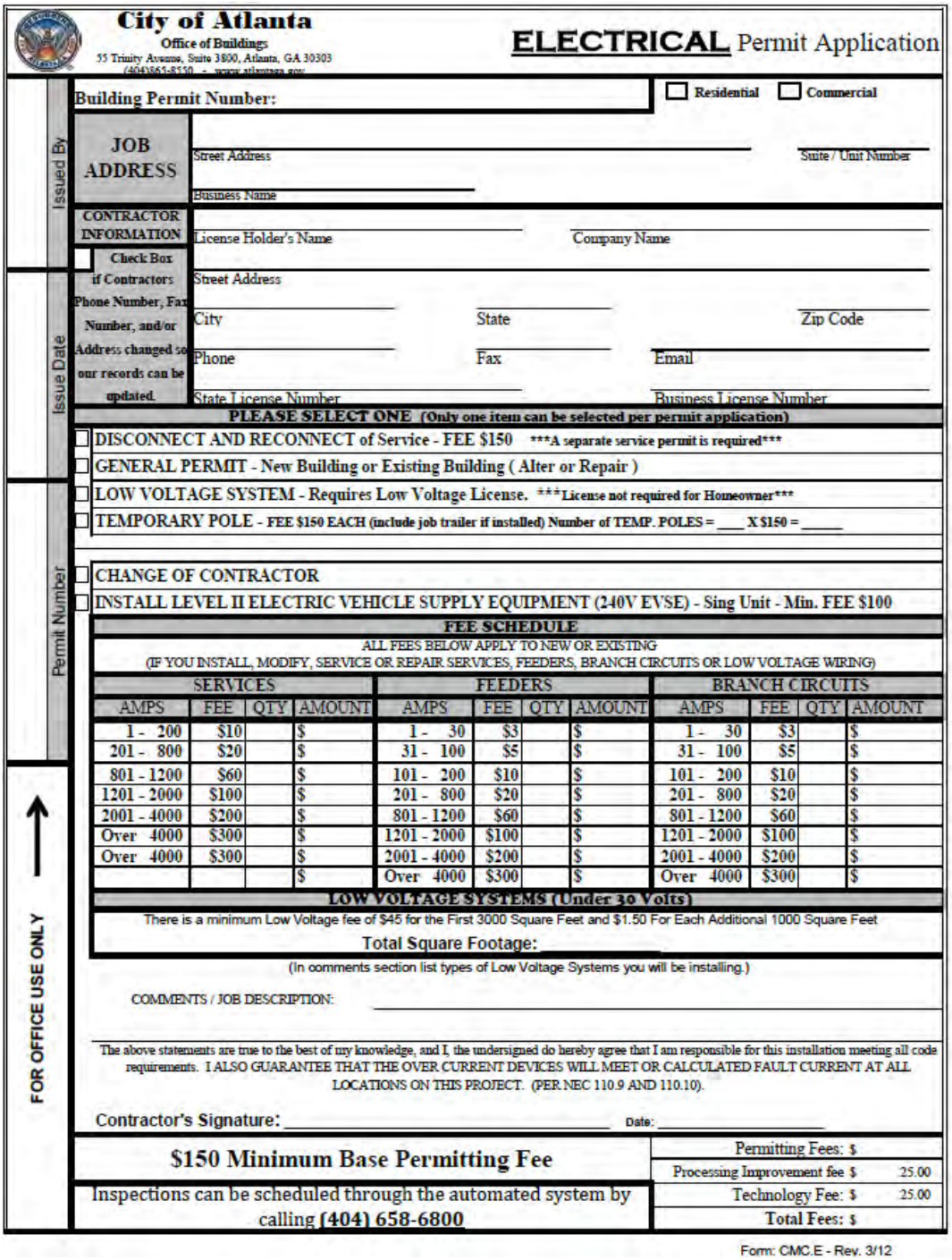
Example Signage

EV Parking Only[2]

EV Charging Station[3]

[1] Sign placed along the interstate to indicate fueling stations at the next exit (Manual on Uniform Traffic Control Devices).
[2] King of Prussia Mall, Upper Merion Township, PA, 2011
[3] Contra Costa County, CA

Section 3.2.9 – Sample Electric Permit Application



City of Atlanta
Office of Buildings
55 Trinity Avenue, Suite 3800, Atlanta, GA 30303
(404)661-8550 - www.atlantaga.gov

ELECTRICAL Permit Application

Issued By | Issue Date | Permit Number | FOR OFFICE USE ONLY

Building Permit Number: ☐ Residential ☐ Commercial

JOB ADDRESS
Street Address _____ Suite / Unit Number _____
Business Name _____

CONTRACTOR INFORMATION
License Holder's Name _____ Company Name _____
☐ Check Box if Contractors Phone Number, Fax Number, and/or Address changed so our records can be updated.
Street Address _____
City _____ State _____ Zip Code _____
Phone _____ Fax _____ Email _____
State License Number _____ Business License Number _____

PLEASE SELECT ONE (Only one item can be selected per permit application)

☐ DISCONNECT AND RECONNECT of Service - FEE $150 ***A separate service permit is required***
☐ GENERAL PERMIT - New Building or Existing Building (Alter or Repair)
☐ LOW VOLTAGE SYSTEM - Requires Low Voltage License. ***License not required for Homeowner***
☐ TEMPORARY POLE - FEE $150 EACH (include job trailer if installed) Number of TEMP. POLES = ___ X $150 = _____
☐ CHANGE OF CONTRACTOR
☐ INSTALL LEVEL II ELECTRIC VEHICLE SUPPLY EQUIPMENT (240V EVSE) - Sing Unit - Min. FEE $100

FEE SCHEDULE

ALL FEES BELOW APPLY TO NEW OR EXISTING
(IF YOU INSTALL, MODIFY, SERVICE OR REPAIR SERVICES, FEEDERS, BRANCH CIRCUITS OR LOW VOLTAGE WIRING)

SERVICES				FEEDERS				BRANCH CIRCUITS			
AMPS	FEE	QTY	AMOUNT	AMPS	FEE	QTY	AMOUNT	AMPS	FEE	QTY	AMOUNT
1 - 200	$10		$	1 - 30	$3		$	1 - 30	$3		$
201 - 800	$20		$	31 - 100	$5		$	31 - 100	$5		$
801 - 1200	$60		$	101 - 200	$10		$	101 - 200	$10		$
1201 - 2000	$100		$	201 - 800	$20		$	201 - 800	$20		$
2001 - 4000	$200		$	801 - 1200	$60		$	801 - 1200	$60		$
Over 4000	$300		$	1201 - 2000	$100		$	1201 - 2000	$100		$
Over 4000	$300		$	2001 - 4000	$200		$	2001 - 4000	$200		$
			$	Over 4000	$300		$	Over 4000	$300		$

LOW VOLTAGE SYSTEMS (Under 30 Volts)

There is a minimum Low Voltage fee of $45 for the First 3000 Square Feet and $1.50 For Each Additional 1000 Square Feet

Total Square Footage: _____

(In comments section list types of Low Voltage Systems you will be installing.)

COMMENTS / JOB DESCRIPTION: _____

The above statements are true to the best of my knowledge, and I, the undersigned do hereby agree that I am responsible for this installation meeting all code requirements. I ALSO GUARANTEE THAT THE OVER CURRENT DEVICES WILL MEET OR CALCULATED FAULT CURRENT AT ALL LOCATIONS ON THIS PROJECT. (PER NEC 110.9 AND 110.10).

Contractor's Signature: _____ Date: _____

$150 Minimum Base Permitting Fee

Inspections can be scheduled through the automated system by calling **(404) 658-6800**

Permitting Fees: $	
Processing Improvement fee $	25.00
Technology Fee: $	25.00
Total Fees: $	

Form: CMC.E - Rev. 3/12

3.2.8 Permitting Process for Electrical Vehicle Supply Equipment (EVSE) in a Single-Family Residence

Single-family residence EVSE permitting occurs when a homeowner wants EVSE installed on their property. EVs with internal charging units that plug into existing 120-volt receptacles do not require modification to your electrical system; this is called Level 1 EV charging.

EVSE that must be wired directly to the electrical system is considered Level 2 and above; these installations will require a permit. Although faster than Level 1 PEV charging, Level 2 charging is best utilized in destination-charging scenarios from 4-6 hours.

More information about EV charging can be found at the U.S. Department of Energy's Alternative Fuel Data Center. Visit: http://www.afdc.energy.gov/fuels/electricity_infrastructure.html

It is important to note that permitting processes will vary by jurisdiction. Please consult the appropriate officials to determine the specific requirements for your jurisdiction.

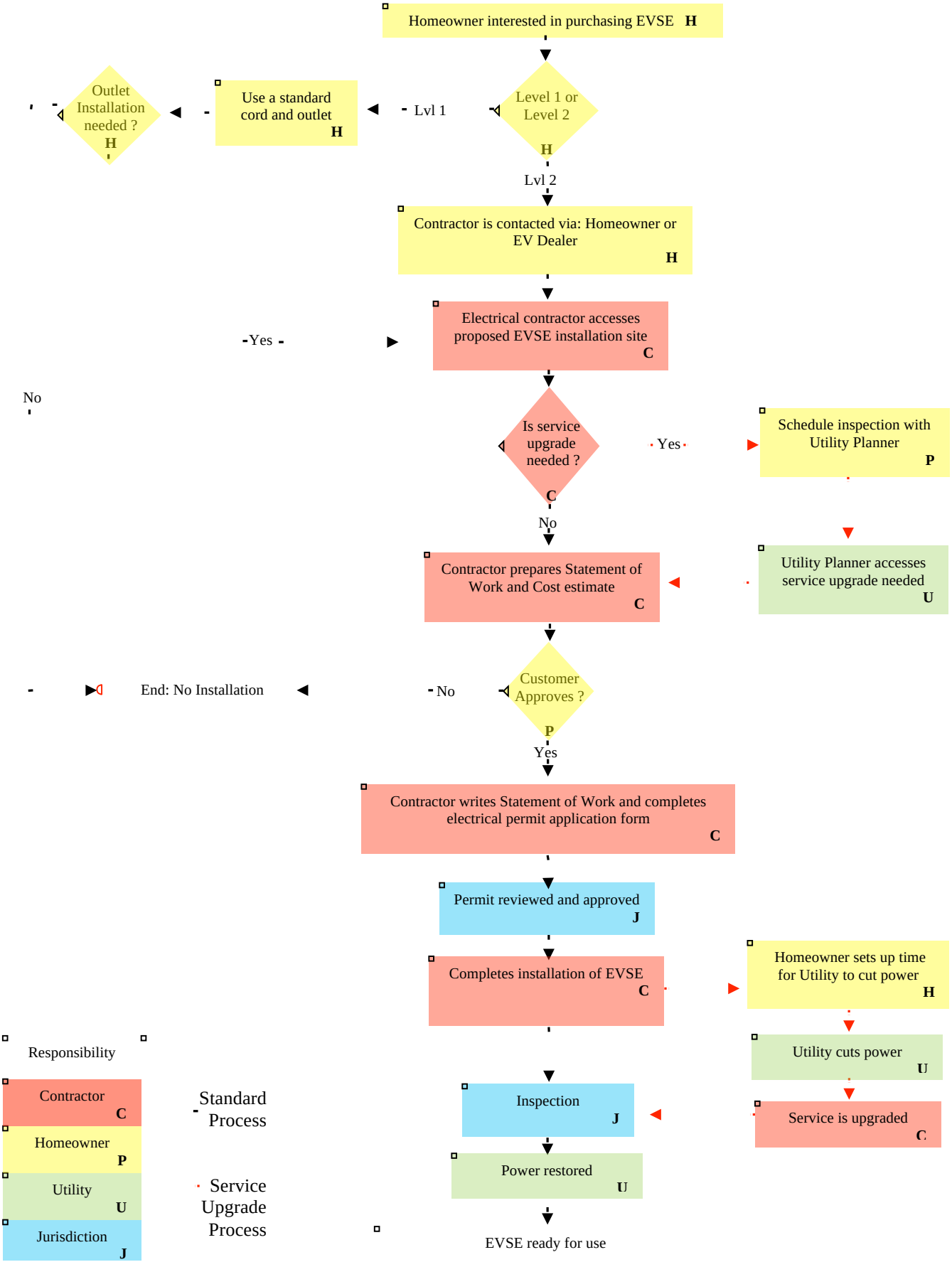
Steps for Permitting Single-Family EVSE

- Homeowner selects a licensed electrical contractor to assess EVSE installation site
- Then fills out an Electrical Permit Form with their electrical contractor
- Afterwards the contractor will submit the completed application; fees are due to the [INSERT CONTACT] at this time
- Permit is issued
- Electrical contractor installs EVSE
- Property inspection conducted by [INSERT CONTACT]
    - Cost of the initial inspection may be included with the permit fee
    - If the initial inspection fails there may be a cost for the follow up inspection(s)

Key Considerations for Property Owners Installing Level 2 Charging Equipment

- Know Level 2 charging equipment guidelines
    - Charging equipment varies by manufacturer. Consult the manufacturer's guidelines and jurisdictional requirements for proper installation
- Prepare property to meet charging equipment requirements
    - As you plan to install Level 2 charging equipment, coordinate with licensed electric contractors and charging equipment providers to avoid miscommunication and avoid delay

Sample Permitting Process for Single-Family Residence to Install EVSE:



3.2.7 Permitting Process for Electrical Vehicle Supply Equipment (EVSE) for a Multi-Family Residence

Multi-family Residence charging equipment permitting occurs when a tenant and/or of an apartment or condominium wants charging equipment installed in the parking area they rent from. EVs with internal charging units that plug into existing 120 volt receptacles do not require modification to your electrical system; this is called Level 1 EV charging.

Charging equipment that must be wired directly to the electrical system is considered Level 2 charging and above; these installations will require a permit. Level 2 charging equipment is designed to accommodate destination-charging scenarios.

More information about EV charging can be found at the U.S. Department of Energy's Alternative Fuel Data Center. Visit: http://www.afdc.energy.gov/fuels/electricity_infrastructure.html

It is important to note that permitting processes will vary by jurisdiction. Please consult the appropriate officials to determine the specific requirements for your jurisdiction.

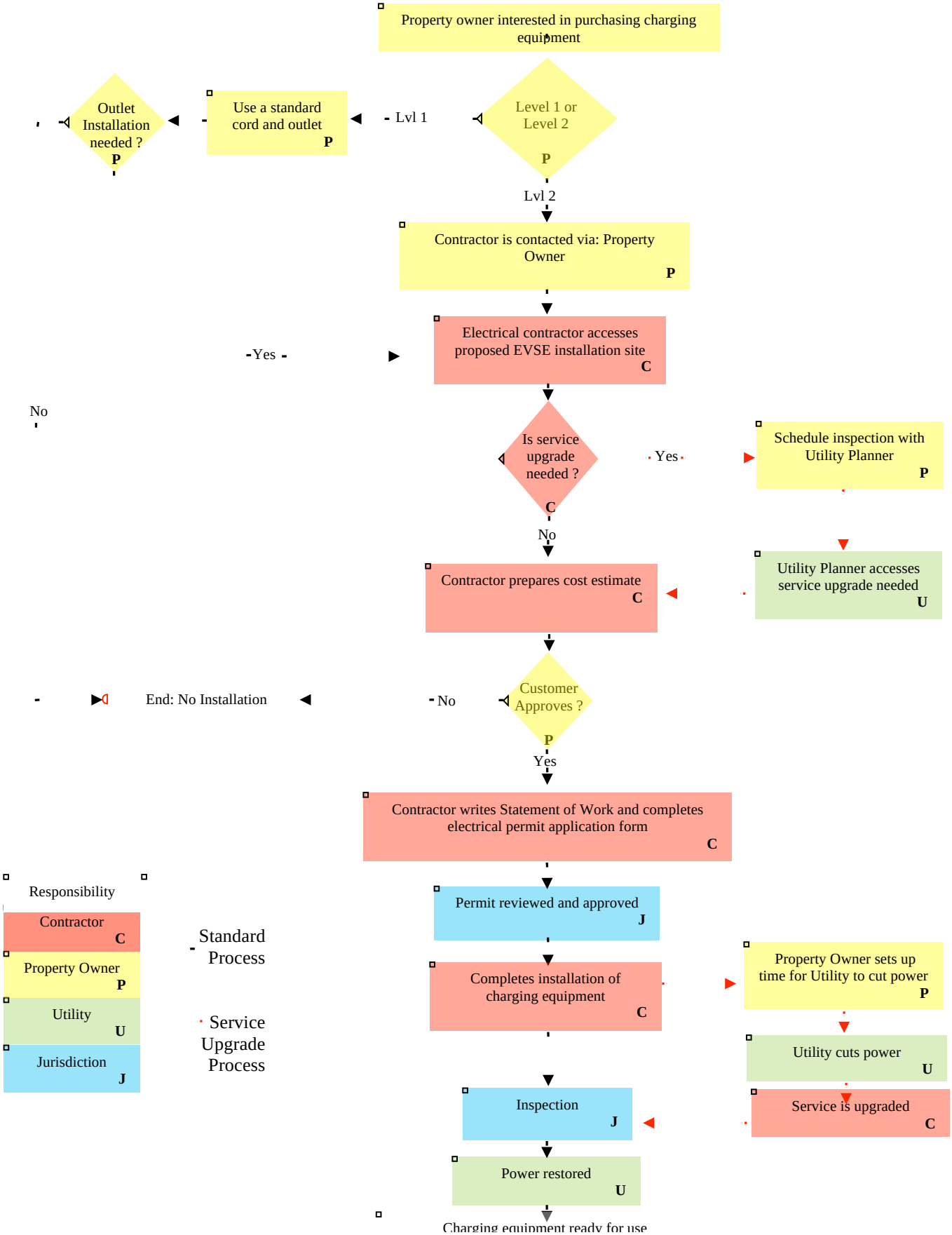
Steps for Permitting Multi-Family EVSE

- Tenant must identify their charging equipment requirements and communicate these to the property owner
- Property owner selects a licensed electrical contractor to assess EVSE installation site
- Then fills out an Electrical Permit Form with their electrical contractor
- Afterwards the contractor will submit the completed application; fees are due to the [INSERT CONTACT] at this time
- Permit is issued
- Electrical contractor installs EVSE
- Property inspection conducted by [INSERT CONTACT]
    - Cost of the initial inspection may be included with the permit fee
    - If the initial inspection fails there may be a cost for the follow up inspection(s)

Key Considerations for Property Owners Installing Level 2 Charging Equipment

- Know Level 2 charging equipment guidelines
    - Charging equipment varies by manufacturer. Consult the manufacturer's guidelines and jurisdictional requirements for proper installation
- Prepare property to meet charging equipment requirements
    - As you plan to install Level 2 charging equipment, coordinate with licensed electric contractors and charging equipment providers to avoid miscommunication and avoid delay

Sample Permitting Process for Multi-Family Residence to Install Charging Equipment:



3.2.6 Permitting Process for Charging Equipment in a Commercial Location

Commercial charging equipment permitting occurs when a property owner in a non-residential area wants to install charging equipment in the parking area of their property. Plug-in electric vehicles (PEVs) with internal charging units that plug into existing 120 volt receptacles do not require modification to your electrical system; this is called Level 1 EV charging.

Charging equipment that must be wired directly to the electrical system is considered Level 2 charging and above; these installations will require a permit. Level 2 charging equipment is designed to accommodate destination-charging scenarios.

More information about EV charging can be found at the U.S. Department of Energy's Alternative Fuel Data Center. Visit: http://www.afdc.energy.gov/fuels/electricity_infrastructure.html

It is important to note that permitting processes will vary by jurisdiction. Please consult the appropriate officials to determine the specific requirements for your jurisdiction.

Steps for Permitting Commercial EVSE

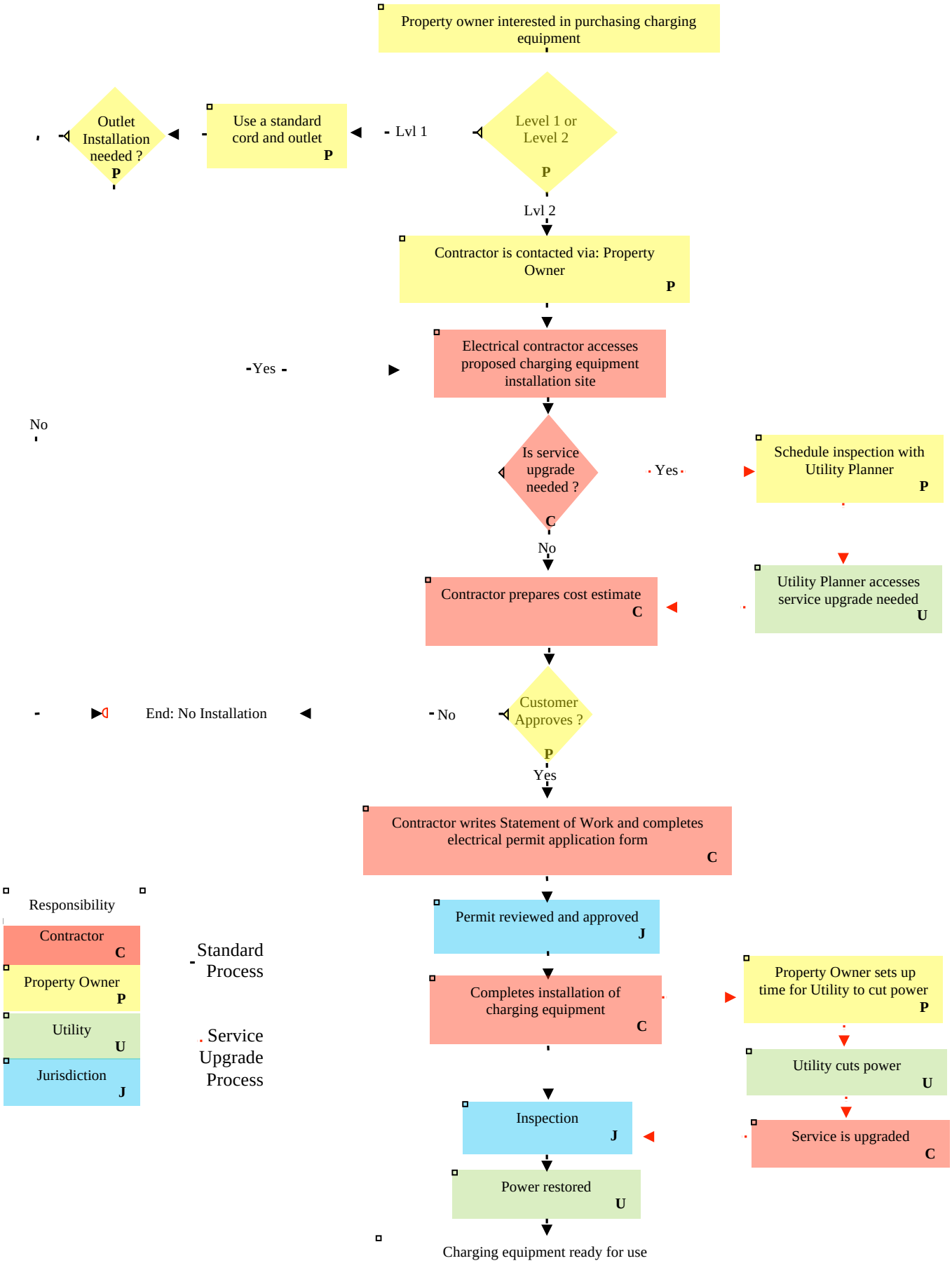
- Property owner selects a licensed electrical contractor to assess charging equipment installation site
- Property owner fills out the appropriate jurisdictional forms with their electrical contractor
- The contractor will submit the completed application; fees are due to the [INSERT CONTACT] at this time
- Permit is issued
- Electrical contractor installs charging equipment
- Property inspection conducted by [INSERT CONTACT]
    - Failed inspections, the [INSERT CONTACT] will likely grant additional inspections
    - A charge may be applied for every re-inspection
- Note: newly installed Level 2 charging equipment may be added to the Department of Energy's Alternative Fuels and Advanced Vehicles Data Center by completing the Fueling Station Submission Form.

Key Considerations for Property Owners Installing Level 2 Charging Equipment

- Know Level 2 charging equipment guidelines
    - Charging equipment varies by manufacturer. Consult the manufacturer's guidelines and jurisdictional requirements for proper installation
- Prepare property to meet charging equipment requirements
    - As you plan to install Level 2 charging equipment, coordinate with licensed electric contractors and charging equipment providers to avoid miscommunication and avoid delay

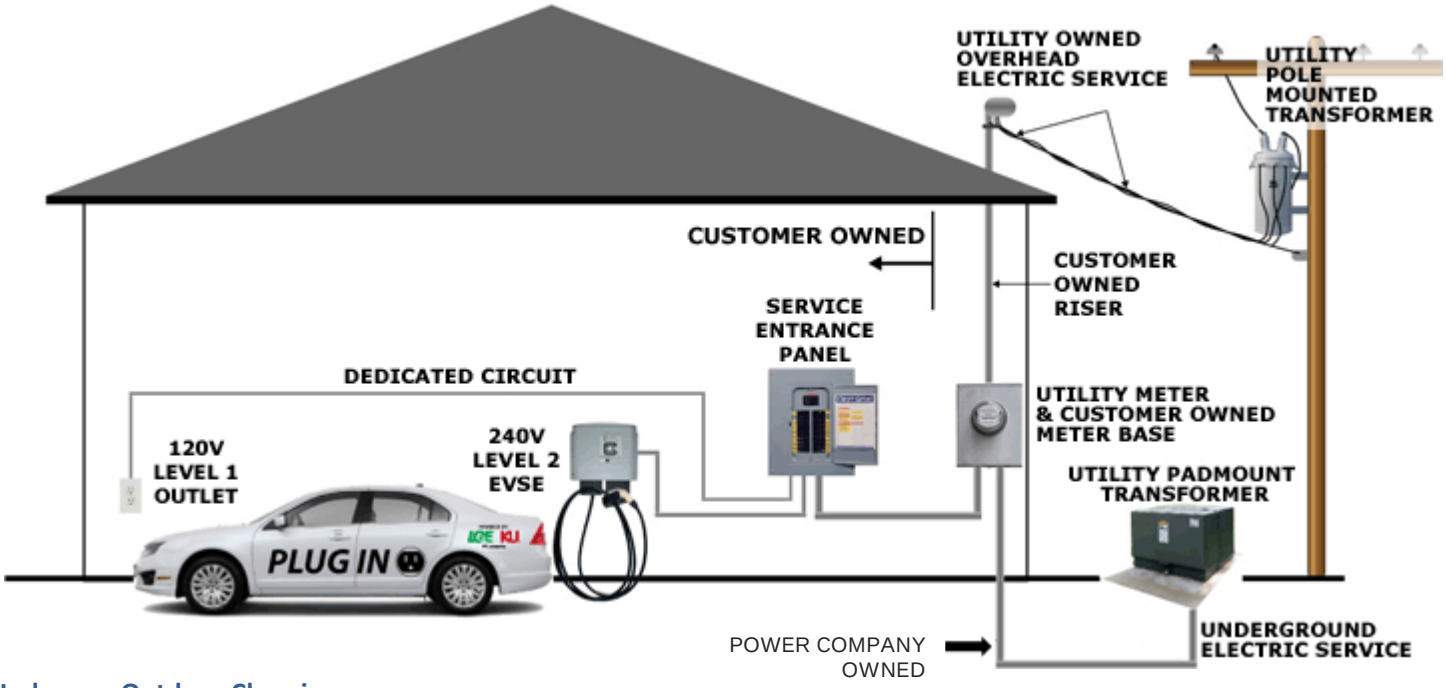
Sample Permitting Process for Commercial Installation of Charging Equipment:

Southeast Regional EV Readiness Workbook



3.2.5 Residential EVSE Location Selection Considerations

The following list describes some of the steps, activities, and scenarios that you may need to follow in order to complete residential EVSE location selection. It is important to note that requirements may vary by jurisdiction—it is your responsibility to comply with all applicable federal, state, and local regulations. You should also consult an electrical contractor.



Indoor or Outdoor Charging

- Garage/carport installations are generally wall-mounted installations
- Outdoor installations can be on pedestals. EVSE should be protected from damage due to temperature extremes by keeping the cord from freezing to the ground or submersion in water

Placement

- EVSE shall be placed in a location that does not impede driver's ability to park
- Location of the charging port on the vehicle should be taken into consideration
- EVSE shall be placed in a clutter-free location
- Wall-mounted EVSE shall be installed to meet jurisdictional requirements
- Place charger such that changes to the immediate environment are minimized

Power Accessibility

- Level 2 installations or greater requires hiring an electrician
- Place the EVSE as close to the utility panel and/or outlet as possible
    - As the distance from the power source increases, the cost of installation increases due to the cost of excavation and/or piping of electric lines
- Identify communication availability from the exact location of the EVSE

- When to install a new meter:
  - When pulling power from a source that is not already metered
  - New service shall be established with the local utility company
  - Installation of a new meter is an uncommon scenario in residential installations

Visibility

- Location ought to be well lit to reduce tripping hazard, EV/EVSE damage, and entanglement with other garage accessories

Flood Zones

- Identify flood zones in your area
- The Code of Federal Regulations, *Title 44 Emergency Management and Assistance, Part 60 Criteria for Land Management and Use* states: "If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall be:
  - Designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy,
  - Constructed with materials resistant to flood damage
  - Constructed by methods and practices that minimize flood damages
  - Constructed with electrical heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding
- Methods of protection for pedestals include "Wet flood proofing" (elevation of the equipment), "Component Protection" (waterproofing techniques), and "Dry flood proofing" (combination of wet flood proofing and component protection)
- Ensure no water puddles where drivers will stand

3.2.4 Off-Street EVSE Location Selection Considerations: Parking lots and decks

The following list describes some of the steps, activities, and scenarios that you may need to follow in order to complete off-street EVSE location selection. It is important to note that requirements may vary by jurisdiction—it is your responsibility to comply with all applicable federal, state, and local regulations. You should also consult an electrical contractor.

Power Accessibility

- Distance from power source determines cost of installation
  - As the distance from a power source increases, the cost of installation also increases due to the cost of excavation and/or piping of electric lines
- Electric wires can be run through conduit (generally less expensive) or under the concrete (generally more expensive).
- Example: City of Raleigh connected their charging stations to streetlights.

Visibility

- Location should be easily visible from the road
- Provide adequate lighting – this reduces tripping, EV/EVSE damage, and safety concerns
- See Section 3.2.10 for signage guide

Protection of EV and EVSE

- It is suggested that concrete bollards be installed to protect cords, reduce tripping hazard, and protect equipment
- Bollards:
  - Should not block access to the charging equipment
  - Should not hinder path to the vehicle's charging block
  - Should impede pedestrian flow to prevent tripping and maintain ADA compliance
  - If the equipment is built to the strength of a bollard, less expensive structures may be used to block pedestrian traffic across the path of the cord

ADA Accessibility

- See 2010 ADA Standards for Accessible Design for ADA Compliance: Reach Range and Operable Parts

User Accessibility

- Non-Wireless: Locate the charger in between two parking spaces to maximize chargers' usability
- Non-Wireless chargers should not obstruct minimum pedestrian clearance widths as defined by your municipality
- Wireless: Place the wireless charger such that it correlates with the location of the receiver plate on the vehicle.
- Pull in spaces only: Consider locating the charging station to maximize user accessibility
  - Example: hang the charger from the ceiling so the charger can reach charging portals on all vehicles
  - Example: place the EVSE in between spaces so that cords can easily reach to the rear of a vehicle
- It is suggested to minimize impact on existing infrastructure and environment when deciding the location
- All conductive chargers must have a cord management device to prevent cords from lying on the ground
  - Cord management may include retractable cords, coiling cords, springy cords, and hanging devices




Flood Zones

- Identify flood zones
- The Code of Federal Regulations, *Title 44 Emergency Management and Assistance, Part 60 Criteria for Land Management and Use* states: "If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall be:
  - Designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy
  - Constructed with materials resistant to flood damage
  - Constructed by methods and practices that minimize flood damages
  - Constructed with electrical heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding
- Methods of protection for pedestals include "Wet flood proofing" (elevation of the equipment), "Component Protection" (waterproofing techniques), and "Dry flood proofing" (combination of wet flood proofing and component protection)
- Ensure no puddling occurs where wireless chargers are installed

3.2.3 On-Street EVSE Location Selection Considerations[1]

The following list describes some of the steps, activities, and scenarios that you may need to follow in order to complete on-street EVSE location selection. It is important to note that requirements may vary by jurisdiction—it is your responsibility to comply with all applicable federal, state, and local regulations. You should also consult an electrical contractor.

Power Accessibility

- Distance from power source determines cost of installation
  - As the distance from a power source increases, so does the cost of installation due to the cost of excavation and/or piping of electric lines
- When to install a new meter:
  - When pulling power from a source that is not already metered
  - New service shall be established with *the local utility company*
- If planning new electrical service, your electrical contractor must coordinate with the [Insert appropriate contact for your community]
- Identify if remote communication with the EVSE is required

Visibility

- Location ought to be easily located from the road
- Provide adequate lighting – this reduces tripping, EV/EVSE damage, and safety concerns
- See Section 3.2.10 for signage guide

Protection of EV and EVSE

- It is suggested that concrete bollards be installed to protect cords, reduce tripping hazard, and protect equipment
- Bollards:
  - Should not block access to the EVSE
  - Should not hinder path to the vehicle's charging block
  - Should impede pedestrian flow to prevent tripping and maintain ADA compliance
  - If the equipment is built to the strength of a bollard, less expensive structures may be used to block pedestrian traffic across the path of the cord

ADA for On Street EVSE installation

- See 2010 ADA Standards for Accessible Design for ADA Compliance: Reach Range and Operable Parts

User Accessibility

- Conductive[2]: Locate the charger in between two parking spaces to maximize chargers' usability

[1] See Section 3.2.2 Installation Considerations for sample measurement specifications
[2] Includes chargers that plug in to the vehicle

- Conductive chargers should not obstruct minimum pedestrian clearance widths as defined by your jurisdictions code
- All conductive chargers must have a cord management device to prevent cords from lying on the ground
- Cord management may include retractable cords, coiling cords, springy cords, and hanging devices

- Inductive (wireless): Place the wireless charger such that it correlates with the location of the receiver plate on the vehicle. (See Installation Considerations in Section 3.2.2)

Flood Zones

- Identify flood zones
- The Code of Federal Regulations, *Title 44 Emergency Management and Assistance, Part 60 Criteria for Land Management and Use* states: "If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall be:
  - Designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy
  - Constructed with materials resistant to flood damage
  - Constructed by methods and practices that minimize flood damages
  - Constructed with electrical heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding
- Methods of protection for pedestals include "Wet flood proofing" (elevation of the equipment), "Component Protection" (waterproofing techniques), and "Dry flood proofing" (combination of wet flood proofing and component protection)
- Ensure no water puddles where drivers will stand

3.2.2 Installation Considerations[1,2]

The following installation considerations are provided as examples. Codes and regulations vary greatly by jurisdiction. It will be important for you to consult with your jurisdiction to determine the appropriate installation requirements.

On-Street Placement and Clearance

- Intersections: Signs may be no closer than:
  - 20' from the closest edge of a cross walk or
  - 30' from the corner of an intersection if no cross walk exists
- Fire Hydrant: Signs may be placed 15' from either side of a fire hydrant
- Driveway/Curb: Signs may be placed 10' from a driveway/curb cut
- ADA: signs shall not be placed within 48" of another pole, parking meter, or EVSE
- EVSE will typically be located 12" from the outside edge of the curb with a tire bumper; the center of the EVSE shall be placed 36" from a curb without a tire bumper

I. Residential Placement and Clearance

- Outlets ought to be installed no less than 4' from the surface to avoid vehicle damage that would expose dangerous wiring

II. Electricity

- It is strongly suggested that a licensed electrician perform EVSE installations
- Refer to sample Single Family Residence – EV Permitting Guide (Section 3.2.8), Multi-Family Residence – EV Permitting Guide (Section 3.2.7), and Commercial (non-residential) Area – EV Permitting Guide (Section 3.2.6)
  - Single phase device: The figures below are the most common service transformer secondary wiring formats in the United States. One wire (the Neutral) must be earth grounded in order to ensure ground-fault protection. If no ground is provided by the electrical service, a grounding stake must be driven into the ground nearby in accordance with local electrical codes. The grounding stake must be connected to the ground bar in the main breaker panel, and the Neutral Connected to the ground at that point.
- Possible Existing Electricity Sources that could supply EVSE with power
  - Street lights
  - Traffic lights
  - Electric parking meters
  - Electric box

III. ADA Compliance: Reach Range and Operable Parts

  - See 2010 ADA Standards for Accessible Design

[1] Note: Always follow installation instructions provided by the equipment manufacturer.
[2] All installations shall adhere to local codes. *Example:* the City of Atlanta adheres to the National Electric Code.

IV. Installing Wall-Mounted EVSE (see Figure 1 for a typical installation)

Location

- A minimum height of 18” from the bottom of the EVSE to the ground is suggested
- For ADA standards, see item IV of the appendix or summary of relevant 2010 ADA Standards

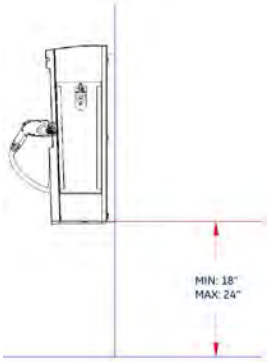


Figure 1. Side View of a Wall-Mounted EV Charging Station

- *Hollow-Wall Mounting*
  - Locate the device such that no fewer than 2 mounting holes take advantage of solid structural frames inside of the wall
  - Holes which do not engage support structures must use proper anchoring hardware such as drywall toggles or molly bolts.
- *Solid-Wall Mounting*
  - Pre-drills hole that are sized for the hardware required
  - Use multi-set or wedge anchor hardware for all points
  - Sleeve anchors ought to be used in brick or stone walls

V. Installing Pole-Mounted EVSE (see Figure 2 for a typical installation)

- *Location*
  - A minimum height of 18” from the bottom of the EVSE to the ground is suggested
  - A high tension-banding tool is required for this type of installation
  - Charging anchor shall be no more than 36” from the ground (See 2010 ADA Standards)

Figure 2. Pole-Mounted EV Charging Station

VI. Installing a Pedestal (see Figure 3 for a typical installation)

- Standard mount is 2'x2'x2'. Subcontractors will apply for easements if there are obstacles (i.e. underground subway, other electrical conduit)

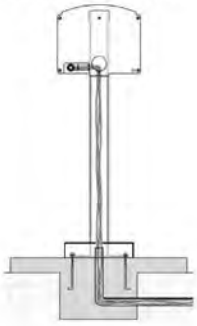


Figure 3. Cross Section of an Installed Pedestal

- The pedestal can be located in between two spaces, if electrical availability allows, to access two spaces
  - The center of the pedestal shall be installed 36" from the edge of the curb or 12" from the curb if a tire stop exists (for pull-in spaces only). See Figure 4

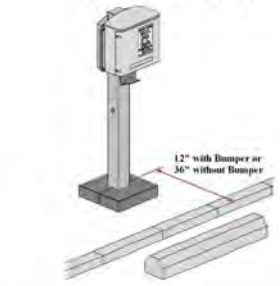


Figure 4. Suggested Distance from Curb[3]

VII. Installing Wireless Charging Pads (See Figure 5 for a typical installation)

- It is suggested to place charging pads in the center of the width of the parking space and 3' from the front of the space. Avoid forcing drivers to back into spaces
- Designed to be embedded into the road and flush
- Will withstand snowplows and other maintenance vehicles
- Consult manufacturer's installation guide for specific installation

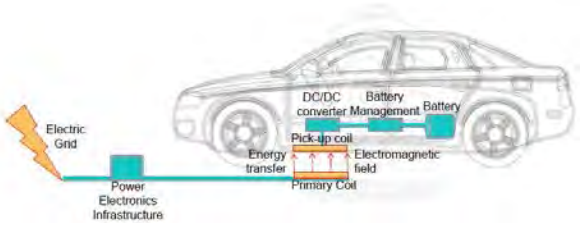


Figure 5. Installation of a wireless charging pad

[3] Clipper Creek. 2011. Standard EVSE Pedestal Installation Guide v1 1 (2)

3.2.1 Choosing Appropriate Charging Station Level

Charger Type		Feature	Best Use
	AC Level 1	> 120V, 16A (dedicated circuit). Designed for the standard American home. > Typically uses the standard three-prong plug (NEMA 5-15/20P) > Takes 8-22 hours to charge a full battery (battery-size dependent) > Simple and easy accessibility and installation > Uses a SAE J1772 plug for the vehicle	> Residential Applications > Long Term Parking > Workplace Applications
	AC Level 2*	> 208/240 VAC, up to 80 A, but typically at around 40 A – 60A > Takes 2-4 hours for full charge >Uses SAE J1772 > Safety requirements described in the National Electric Code 625, 2008 and beyond	> Residential Applications > Workplace Applications > Commercial Applications > On Street Parking
	DC Fast Charge*	> 480VOC, 100+ A > 80% charge in 30 minutes > Existing equipment uses CHAdeMO Connectors	> Retail Applications > Commercial Applications > On Street Parking
	Wireless/Inductive Charger*	> 208/240V electrical outlet to your vehicle's existing on-board battery charger. > Charging time depends on the battery capabilities of the vehicle.	> Home > Parking garages > Fleet Parking

*require electrical contractor for installation

Section 3.1.3 – Residential Charging Equipment Installation Considerations

There are a number of steps to consider when installing residential charging equipment. There are also different scenarios under which residential charging equipment might be installed. The following list describes some of the steps, activities, and scenarios that you may need to follow in order to complete on-street installation. It is important to note that requirements may vary by jurisdiction—it is your responsibility to comply with all applicable federal, state, and local regulations. You should also consult an electrical contractor.

1. If residence is regulated by a homeowner's association (HOA) or exists in a special zoning district, identify requirements set forth by the appropriate entity
    a. If location is in a Special Planning district, obtain design approval through the [Insert appropriate contact for your community]
    b. A proposed ordinance defines permitted locations
        i. See Section 3.4.4 for Proposed Model Zoning Code Update Ordinance
2. Purchase electric vehicle charging station (EVSE)
    a. Determine the appropriate technology for the use
        i. See Section 3.2.1 for Choosing Appropriate Charging Station Level
    b. Determine best structure for technology
        i. Conductive: Pedestal or Wall Mount
        ii. Inductive: Wireless Charging
    a. Make sure your charger has been certified for EV use. The equipment will be marked by a Nationally Recognized Testing Laboratory (i.e. UL and/or ETL)
3. Installation Site (see Section 3.2.5 for Residential EVSE Location Selection)
    a. Indoors: inside of an enclosed garage. The charging equipment is inside and the charging occurs inside of the garage where the device is not exposed to the environment
    b. Outdoors: outside of any environmental protection, carports, and situations where the EVSE is inside a conditioned space (i.e. a garage) but charging occurs outside
    c. Considerations:
        i. Location (indoor/outdoor)
        ii. Placement
        iii. Distance from electricity source
        iv. Visibility
        v. Existing landscape
        vi. Flood zones
4. Complete electrical permitting guide (See Section 3.2.8 for EVSE Permitting Process in a Single Family Residence)
    a. Contact contractor (unless using Level 1 or do not need to re-route electrical wires)
    b. Contact Utility Planner (if upgrade needed)
    c. Contractor presents to the customer a Statement of Work with cost estimate
    d. Upon customer approval, contractor submits Statement of Work and electrical permit application form
    e. Permit approved/denied

5. Complete easements request
    a. Contact: [Insert appropriate contact for your community]
        i. If installation requires access to, or construction through the public right-of-way, complete right of way easement request

Section 3.1.2 – Off-Street Charging Equipment Installation Considerations

There are a number of steps to consider when installing off-street charging equipment. There are also different scenarios under which off-street charging equipment might be installed. The following list describes some of the steps, activities, and scenarios that you may need to follow in order to complete off-street installation. It is important to note that requirements may vary by jurisdiction—it is your responsibility to comply with all applicable federal, state, and local regulations. You should also consult an electrical contractor.

1. Commercial and Multi-Family Lot Owners Only: Obtain permission from your property owner, homeowner's association, or parent company prior to installation.
2. Procure electric vehicle charging station (EVSE)
    a. Send out a request for proposals (RFP) for equipment specifying requirements, if necessary (see Section 3.4.6 for a sample RFP)
    b. Make sure your equipment has been certified for EV use. The equipment will be marked by a Nationally Recognized Testing Laboratory (i.e. UL and/or ETL) Determine best charger structure for use:
        i. Conductive: Pedestals & Wall mounts
        ii. Inductive: Wireless Charging Stations
    c. Determine the appropriate technology for the use
        i. See Section 2.1 for Choosing Appropriate Charging Station Level
3. If municipality owns but does not operate the equipment, an RFP for a management company ought to be issued (or included in the RFP for the charging station).
    a. Managing company is responsible for:
        i. Usage monitoring
        ii. Rate collection
        iii. Maintenance of the equipment
        iv. Any other items dictated in the contract agreement.
4. Installation Site
    a. Locations in special planning zones need approval from [Insert appropriate contact for your community]
    b. Considerations (see Section 3.2.4 for Off Street EVSE Location Selection)
        i. Proximity to power source
        ii. Visibility
        iii. Equipment protection
        iv. ADA Accessibility
        v. User Accessibility
        vi. Existing Landscape
        vii. Water Patterns
5. Determine proper signage and space use
    a. Information that should be displayed on each EVSE device and be easily visible in all conditions:
        i. A contact number for customer support

   ii. A unit identification number that can be easily located and read
   iii. Fees and terms of use
   b. Signs to be installed adjacent to the device (Refer to Section 3.2.10 for Signage Guide):
   c. Proposed signage information requirements are included in Section 3.4.4
   d. Proposed EV parking enforcement in Section 3.4.3.
6. Public Parking
   a. Metered space
   b. Non-metered space
7. Complete sample electrical permitting guide (See Section 3.2.6 for EVSE Permitting Process in a Commercial Location or Section 3.2.7 for EVSE Permitting Process in a Multi-Family Location)
   a. Contact contractor (unless using Level 1 and do not need to re-route)
   b. Contact Utility Planner (if upgrade needed)
   c. Contractor presents to the customer Statement of Work with cost estimate
   d. Upon customer approval, contractor submits Statement of Work and electrical permit application form
   e. Permit approved/denied
8. For commercially and privately owned EVSE that is installed on public property, complete appropriate easement request
9. Installation
   a. See Section 3.2.2 for Installation Considerations
10. Follow applicable codes and regulations for your jurisdiction

Section 3.1.1 – On-Street Charging Equipment Installation Considerations

There are a number of steps to consider when installing on-street charging equipment. There are also different scenarios under which on-street charging equipment might be installed. The following list describes some of the steps, activities, and scenarios that you may need to follow in order to complete on-street installation. It is important to note that requirements may vary by jurisdiction—it is your responsibility to comply with all applicable federal, state, and local regulations. You should also consult an electrical contractor.

1. Municipally owned EVSE:
    a. Determine the appropriate technology for the use
        i. See Section 3.2.1 for Choosing Appropriate Charging Station Level
    b. Determine best charger structure for use:
        i. Conductive: Pedestals and Wall Mounts
        ii. Inductive: Wireless Charging Stations
    c. Procure electric vehicle charging station (A sample RFP is included in Section 3.4.6 if a bidding process is required)
    d. Make sure your charger has been certified for EV use. The equipment will be marked by a Nationally Recognized Testing Laboratory (i.e. UL and/or ETL)
2. 3rd-Party Operated Systems:
    a. An RFP for a management company ought to be issued
    b. Managing company is responsible for:
        i. Usage monitoring
        ii. Rate collection
        iii. Maintenance and upgrades of the equipment
        iv. Identification of appropriate software for data collection *(if data collection is necessary for your charging equipment)*
3. Installation Site
    a. Determine if street is city owned or state owned. This will determine which entity will grant you an encroachment agreement, if needed
    b. Locations in certain zoning categories will require approval and additional requirements; check with the appropriate contact in your community
    c. Location Considerations (see Section 3.1.1 for On Street EVSE Location Selection):
        i. Proximity to power source
        ii. Visibility
        iii. Equipment protection
        iv. User Accessibility
        v. Existing Landscape
        vi. Water Patterns

4. Determine proper signage and space use
    a. Information that should be displayed on each EVSE device and be easily visible in all conditions:
        i. A contact number for customer support
        ii. A unit identification number that can be easily located and read
        iii. Fees and terms of use
    b. Signs to be installed adjacent to the device (Refer to Section 3.2.10 for Signage Guide):
    c. Proposed signage information requirements are included in Section 3.4.4
    d. Proposed EV parking enforcement in Section 3.4.3.
5. Public Accessibility Determinations
    a. Metered space
    b. Non-metered space
6. Privately or commercially owned EVSE installed in the public right-of-way
    a. Obtain approval from [Insert appropriate contact for your community]
    b. Obtain a Qualified Contractors Permit
    c. Obtain a Lane/Sidewalk Closure Permit if the installation will require blocking the sidewalk
    d. Right of way easements (See Section 3.4.5 for Proposed Sample Encroachment Agreement)
7. Complete electrical permitting guide (See Section 3.2.6 for Permitting Process for EVSE in a Commercial Location)
    a. Contact contractor (unless using Level 1 and do not need to re-route)
    b. Contact Utility Planner (if upgrade needed)
    c. Contractor presents to the customer Statement of Work with cost estimate
    d. Upon customer approval, contractor submits Statement of Work and electrical permit application form
    e. Permit approved/denied
8. Installation
    a. See Section 3.2.2 for Installation Considerations
9. Follow applicable codes and regulations for your jurisdiction

The Menu

A list of actions that leaders
can take to make their
community a plug-in pioneer.

v1.1 Final Draft 18 Mar 09

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For background research, on-line database, and customizable calculators, visit www.projectgetready.com.

Rocky Mountain Institute

Project Get Ready is a Rocky Mountain Institute Initiative: www.move.rmi.org

Authors: Laura Schewel and Jenn Wilson. Contact: smartgarage@rmi.org

Project Get Ready: Helping Communities Become Electrified Vehicle Pioneers

Electrified vehicles are coming

Imagine your city free from the strain of volatile gas prices, where quiet vehicles drive the street emitting zero air pollution. This is the promise of electrified vehicles, or "plug-ins", one of the most important components of transitioning to a greener economy. These vehicles can be new or converted conventional vehicles, run wholly or partially on electricity and can reduce operating costs, air pollutant and greenhouse gas emissions, and dependence on oil.

Early models already have hit the road in Asia. In the U.S., conversion shops have been retrofitting existing vehicles to be plug-ins and building low-speed EVs for several years at small, but fast increasing, volumes. Tens of thousands of factory-made plug-ins are expected to be available in the U.S. in late 2010 and 2011.

Transitioning to electrified vehicles mean initial costs and change, creating barriers

There are two key barriers to plug-ins: first, the current battery technology is very expensive, adding adding thousands of dollars to the cost of a plug-in. Next, many well-established sectors must change to accommodate plug-ins. Automakers must manufacture a new drivetrains. Consumers must learn the pros and cons (mostly pros!) of a plug-in lifestyle, and a new way of valuing upfront costs against operational savings. Utilities must learn to manage a large and mobile load. Cities, retailers, and other businesses must incorporate a new infrastructure of charge spots. All these players must build a new system of connectivity in order to line up charging times, billing, consumer preferences, and more. Such changes create a multitude of barriers, not the least of which is "how can all these changes happen simultaneously and in a coordinated manner?"

Overcoming these barriers requires cross-community collaboration

We believe that the best way for the nation to get ready is for pioneering communities to get ready, developing new systems that suit local needs, while maintaining communication and coordination between communities. Project Get Ready was founded to:

1. Help community stakeholders work together to create a plan to become plug-in-ready, and
2. Provide a forum for pioneering communities to openly exchange lessons learned and best practices, and show their progress to automakers and other national/global businesses.

This menu prioritizes the "must have" actions for your community to get ready

Rocky Mountain Institute (RMI) has worked with industry leaders over the past year to document a plug-in vision and the key barriers to that vision, as well as strategies to overcome them. Our plug-in vision includes all forms of electrified vehicle, such as plug-in hybrid electrics (PHEVs), pure battery electrics (EVs) and conventional vehicles converted to plug-ins. We have prioritized the most important actions cities must take to become plug-in ready, and divided them into two tiers:

- "Must have" actions: For a community to be ready, it must meet most of these.
- "Nice to have" actions: A city meeting these actions will accelerate plug-in success.

We call it a menu because it isn't a black-and-white checklist: different communities need different approaches. This menu is a dynamic document; it will change as we learn from our partners what works and what doesn't. We will designate communities as "ready" based on meeting most (not all) of our suggested actions and, more importantly, having a coordinated and active plug-in community.

In the main body of this document, we have estimated the cost, revenues, and potential jobs created for each action (where possible) and organized the actions by primary stakeholder. This menu presents interim incentives targeted at the first five years, or two percent of registered vehicles. After attaining the 2% target, communities should re-evaluate their plans and activities.

15 "Must Have" Actions*

Barrier: Not enough cars in the pipeline, OEMs need proof of future consumer demand

1. Corporate/city/state fleets commit to buy a certain number of plug-ins (RFPs for major purchases).
Suggested target: 180 vehicles, or five fleets purchasing or converting 30 plug-ins each

2. Stakeholder group provides a place for interested consumers/fleets to register early, and put cash down to reserve plug-ins (cash used for readiness where possible).
Suggested target: 5,000 commitments in first 2 years

Barrier: How can we manage this as a multi-sector, city-wide project?

3. Create collaborative stakeholder group within the community to help regulatory, commercial, and community interests align. Sign on to a clear regional plan (based on this menu!). Plan should give consideration to BEVs, PHEVs, EREVs, LS-EVs, and conversions.

4. Have one "champion" whose job it is to keep this group moving forward, who has authority
Suggested target: part time job, 20 hours/week

Barrier: How can we bring down upfront costs for consumers?

5. Work with banks and dealers to offer low-interest loans for plug-ins, based on projected lower operating costs from gas savings.

6. Bundle all key incentives at vehicle point of purchase (home charger vouchers, rebates, etc.)

Barrier: Consumer hesitation at diving into a new paradigm for mobility

7. Perks: access to HOV lanes, free tolls/downtown parking, reserved airport parking.

8. Create consumer, city government, local business and utility education plans including test drives and "quick lease" options to individual and fleet consumers as well as high profile drivers.

9. Reduced (or free) electricity rates for charging.

Barrier: Red tape around infrastructure installation

10. Fast-track permitting for charging stations.

11. Ensure new and reconstruction/renovation building codes support the operation of plug-ins.

Barrier: What if these cars exacerbate my peak load?

12. Tie provisions of free home and public charge spots, as well as free or cheaper electricity, to either utility override power or "no charge" times.

Barrier: Who will pay for infrastructure?

13. Local employers/retailers provide some charge stations at parking decks.
Suggested target: 4,000 workplace stations (because 60% of car-owners are assumed to have home stations)

14. Install public charge spots in high-traffic zones and parking areas, either with public money (via utility or gov't for the first 2% of vehicles) or private money that uses the stations to market.
Suggested target: 1 charging station for every 100 vehicles not including workplace charging stations

15. Provide affordable and available—or free—Level 2 home-charger/driveway circuit installation.
Suggested target: 6,000. We assume 60% of our 10,000 car-owners have driveways/garages.

Visit www.projectgetready.com for examples of actions taken across the globe, to use our jobs and business case calculators, to get details on our top barriers, to see what other cities are doing, and to get your community signed on.

10 "Nice to Have" Actions

Barrier: Not enough vehicles in the pipe-line

1. Support non-traditional OEMs, conversion shops, and other plug-in manufacture businesses with tax incentives, contracts.

Barrier: Who will service my plug-in?

2. All xEV owners get access to a "plug-in concierge" call service for info on trained mechanics/ electricians, where to charge, how to deal with technological issues, for the first five years of vehicle ownership. Plug-in service is better than traditional service.

3. Invest in technical education and worker transition assistance needed to rapidly train plug-in service technicians, encourage plug-in curricula in trade/technical colleges and community colleges, as and create/fund modules in plug-in crash safety training for fire/police

Barrier: How can we bring down upfront costs for consumers?

4. Provide direct cash incentives to consumers for vehicle (including tax rebate, waiving of registration fee/sales tax, etc.) so that plug-in-premium is eliminated or so that plug-in are markedly cheaper than comparable ICEs

Suggested target: $3000/vehicle on top of federal rebate, and $8,000/vehicle once federal rebate has expired

5. Introduce a government/3rd party sponsored battery warranty program to share the risk and to reduce the near-term cost of advanced batteries

Barrier: Consumers have limited understanding of plug-ins

6. Launch large scale marketing plan to highlight the "empowerment, fun and energy independence" associated with plug-in, including viral, hands-on, TV, and radio advertising as well as a website.

7. Bundle plug-in purchase with a "green power only" utility contract and discounts on home solar, AMI installation, a smart grid upgrade, bike, bus pass, and/ or light rail pass to high-light plug-in role in the green lifestyle

8. Foster early roll-out in taxi fleets and rental cars

9. Develop materials to educate the drivers of tomorrow by reaching students of all levels (elementary- college) with related curricula

Barrier: What if this exacerbates my peak load?

10. Install sub-meters (or Smart Grid) for plug-ins

Got different or better ideas? Think your community can be ready with a different set of options? Please let us know at www.projectgetready.com, or email smartgarage@rmi.org.

Summary of System Wide Costs, Benefits, and Jobs

These and all cost/benefit numbers in this report use a hypothetical "ready" city with plug-ins accounting for 2% of its total registered vehicles by December, 2014. For the purposes of the calculations in this document, we say that 2% means 10,000 plug in cars after 5 years.[1] In addition to financial costs, these actions will incur costs in the form of time and energy. In some cases, we qualitatively describe the time/hours we estimate necessary to complete an action, and leave it to individual cities to assess that cost (and if our estimate is correct).

Figure 1: Costs and benefits of "must-have" Project Get Ready actions[2]

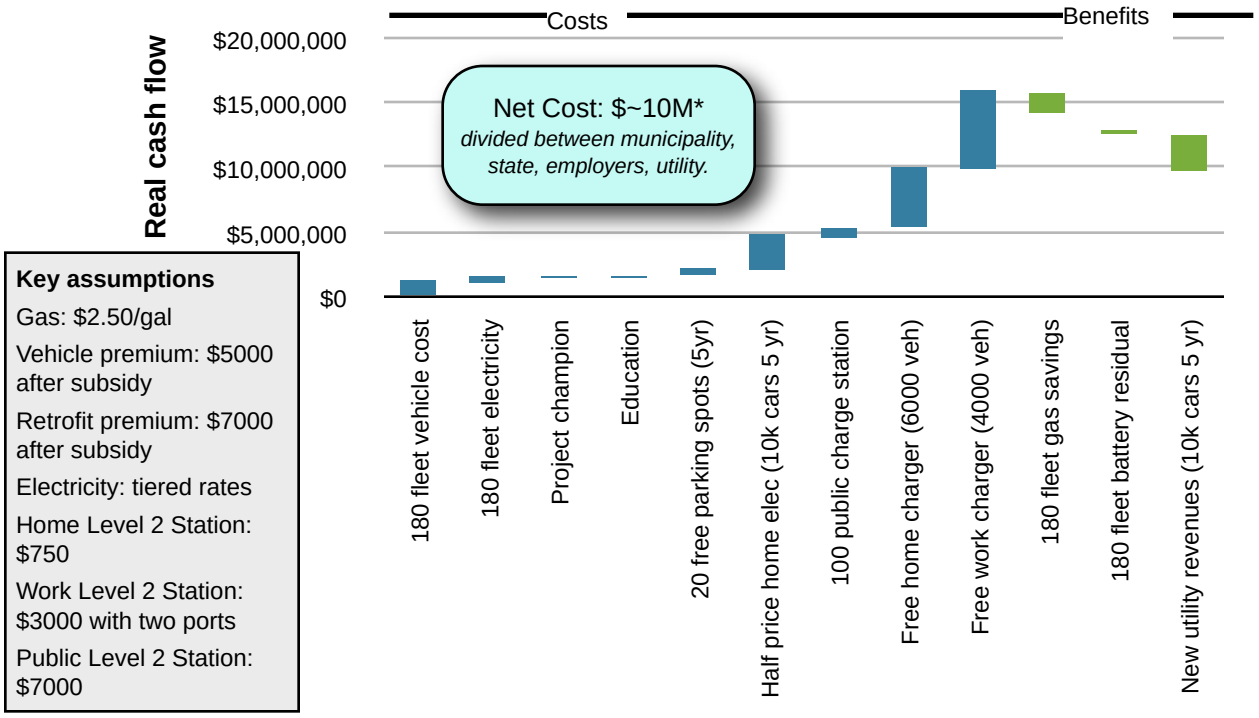


Figure 2: Jobs created by "must have" actions *and* 10,000 new plug in vehicles in 2014 based on Bureau of Labor Statistics multipliers

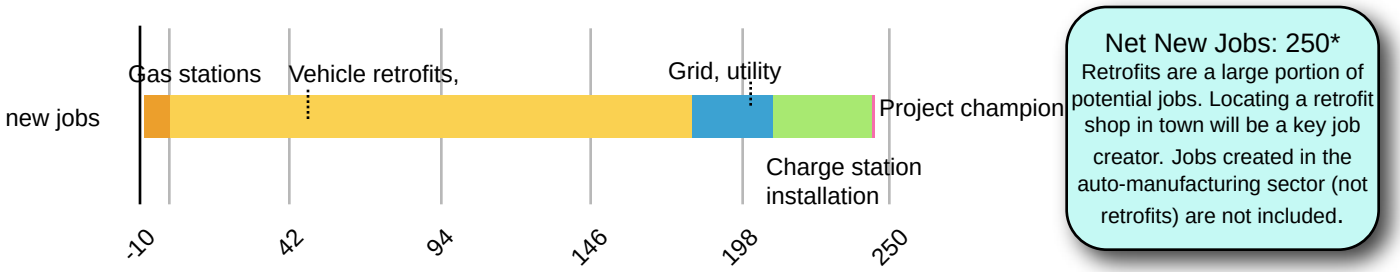


Figure 3: Reduction figures for meeting "ready" goal of 10,000 vehicles in five years

	# plug-ins	GHG savings in 2014 (tonnes CO_2-e/year)	Gallons of oil avoided in 2014 (gal/year)
Over 5 Years	10,000 (half retrofits)	9,750 in 2014, worth $400,000 at $40/tonne	2 million gallons avoided in 2014, or $5 million at $2.50/gal.

[1] Our hypothetical city is modeled on Denver, Colorado. In the first year, only conversions and low-speed EVs will be available.

[2] For the purposes of this figure fleets of 30 cars are assumed to be 50% new vehicles and 50% retrofits

Figure 4: Incremental Costs and Benefits of One Factory Model Car (3)

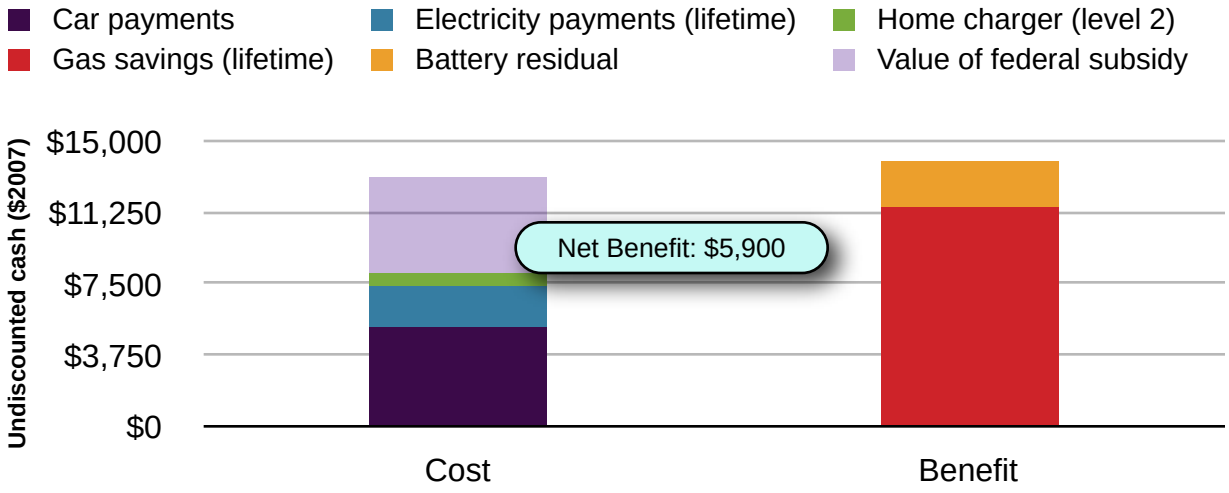


Figure 5: Incremental Costs and Benefits of One Retrofit Car (4)

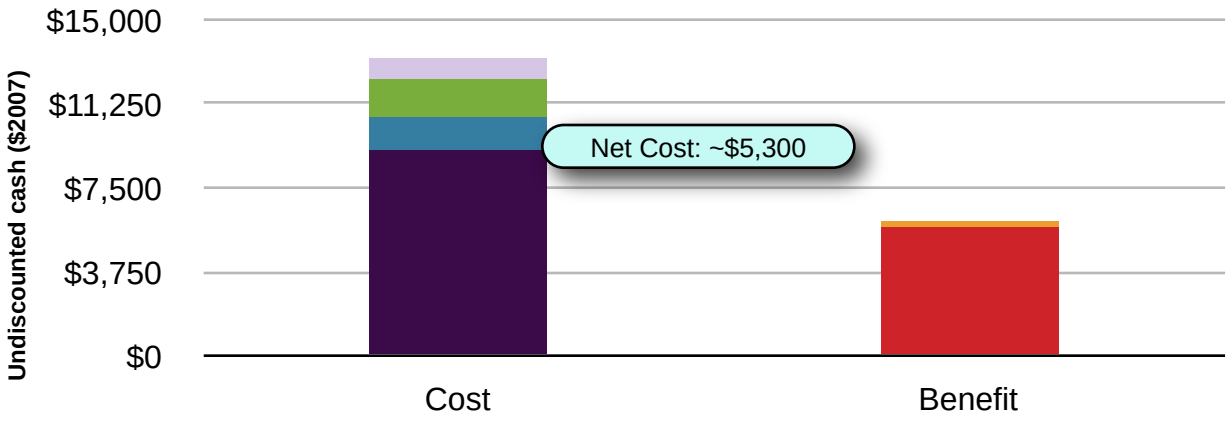
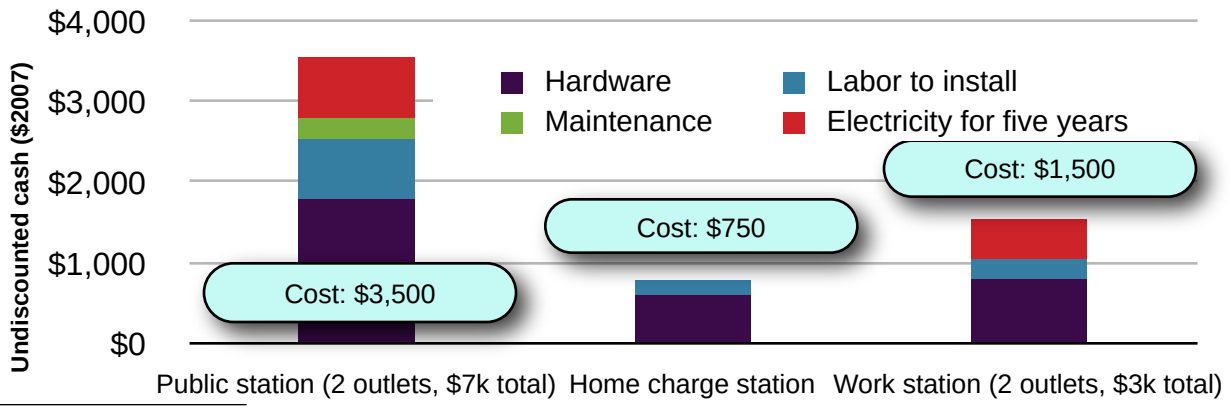


Figure 6: Costs Associated with One Level 2 (240V) Charge Station Per Outlet (5)



[3] Includes $5,000 assumed federal subsidy off $11,000 incremental cost over a $30,000 vehicle.
[4] Only includes cost of retrofit (not cost of vehicle that gets retrofitted). Includes $3,000 assumed federal subsidy off a $10,000 total cost. Retrofit has a smaller battery than factory model, hence smaller gas savings.
[5] Cost for charging stations vary greatly depending on where they are installed. Numbers shown here are based on industry interviews, and represent estimates for an average, existing building. Some public charge stations can cost half as much, or three times as much. Installing charge spots in new construction costs a small fraction of the price of installing in an existing building . We assume the public and work station will provide five years of free electricity.

Actor: Municipal Government

Here, we list the actions in which the municipal government could be primary actor, with an estimate of net cost. Note: many of these actions could be taken by state governments as well. Visit www.projectgetready.com for examples of implementation.

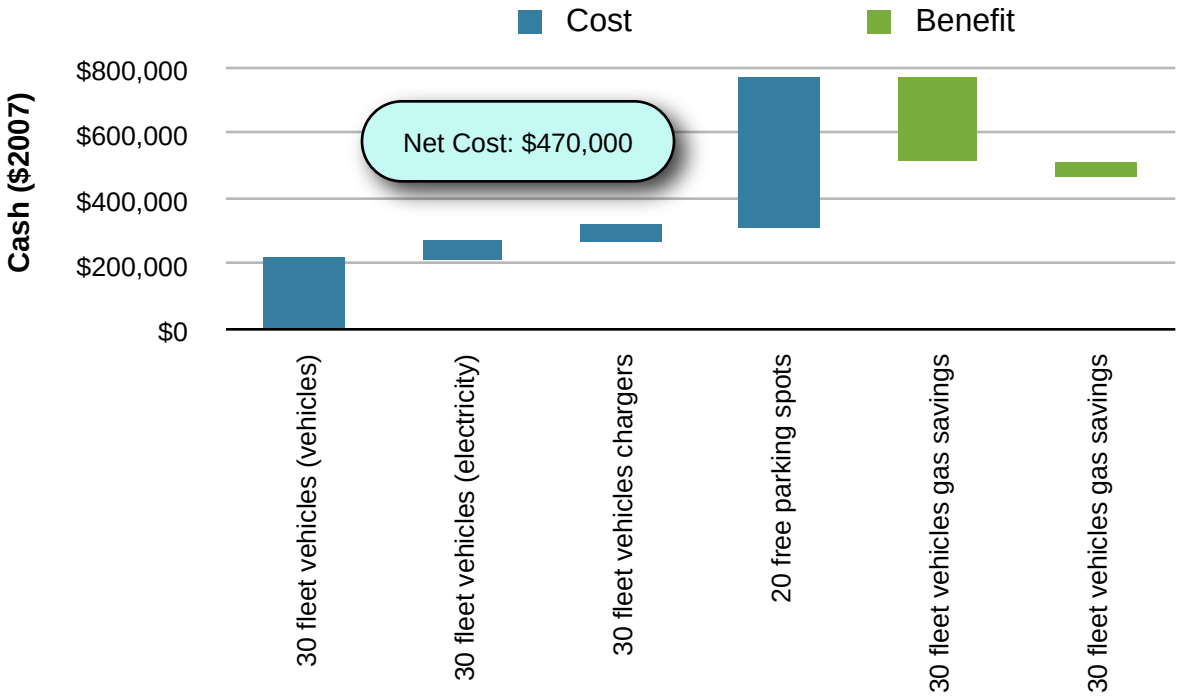
Action (with potential enablers)	Net Cost (+ means savings)
"Must Have" actions that ONLY municipal government can lead	
Participate in local/regional stakeholder council that meets regularly to create the plug-in readiness plan, and check-in on implementation.	n/a
Buy 30 plug-ins for municipal fleet over five years.	$13,000
Give free parking spots in desirable locations (for five years)	-$22,000 ea.
Fast track permitting for charging stations	n/a
Revise code for new buildings and renovations to be plug-in ready	n/a
Update municipal buying guidelines to include 'total environmental cost' of fleet ownership	n/a
"Must Have" actions that municipal governments OR another stakeholder can lead	
Assign one staff member to be the "champion" of the regional stakeholder council.	-$40,000
Bundle all incentives at point of purchase	n/a
Install 100 public charge spots in high-traffic zones/parking areas	-$700,000
Provide up to $3,000 coupon for free installation of 220V home charging (for 60% of vehicles assumed to want Level 2 home charging)	-$4,500,000
Create and implement basic consumer education plan, including basic educational materials and test drives/leases	-$100,000
"Nice to Have" actions for municipal governments	
Incentivize and subsidize local OEMs, suppliers, conversion shops for plug-ins.	n/a
Invest in technical education and worker transition assistance needed to train plug-in service technicians, encourage plug-in curricula in technical and community colleges, and create/fund modules in plug-in crash safety training for fire/police.	n/a
Sponsor battery warranty program to share the risk and to reduce the near-term cost of advanced batteries	To come*
Expand rebate, educational offerings	n/a
Enable plug-in roll-out in taxi fleets	n/a
Provide $3,000/vehicle incentive, direct to first 10,000 consumers	-$30,000,000
Enablers: direct rebate at the dealer, tax rebates, waiving of registration and other fees.	

*RMI will estimate these values in the coming months with data from our partners.

Municipal Government: Business Case

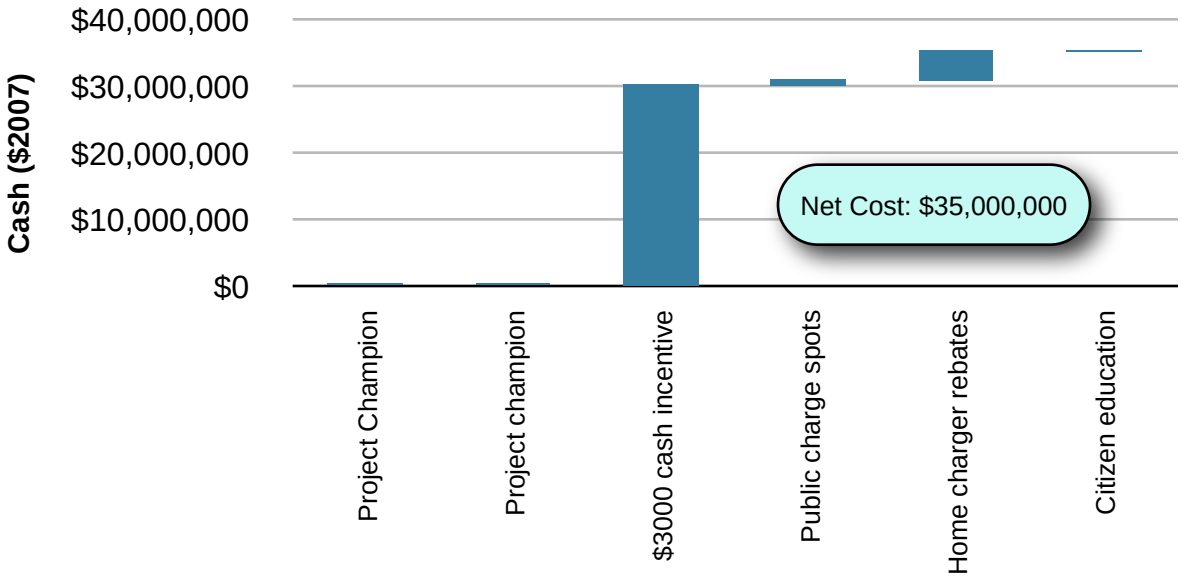
The following two waterfall chart present the costs and benefits of the actions described above for the municipal government over five years. For key assumptions, please see the last page of this menu. For more information about the case for individual actions, see Appendix A and to input your own assumptions into our calculator, please visit www.projectgetready.com.

Cost/Benefit for Municipal Government Actions Over Five Years: "Must Have" Gov't ONLY



Cost/Benefit for Municipal Government Actions Over Five Years: "Must Have" Gov't OR other

Local governments may not be able to take on all the costs below. In addition to sharing these costs, they can play a vital role in encouraging other stakeholders to take on these costs. In the coming months, RMI will be exploring the "indirect" benefits such as green branding, attracting green consumers/citizens, etc. to help encourage community stakeholders.



Non monetized benefits:
Recognition as city leader in green technology, green collar jobs, reduced air pollution and GHG emissions

Actor: Utility (and their regulators/grid operators)

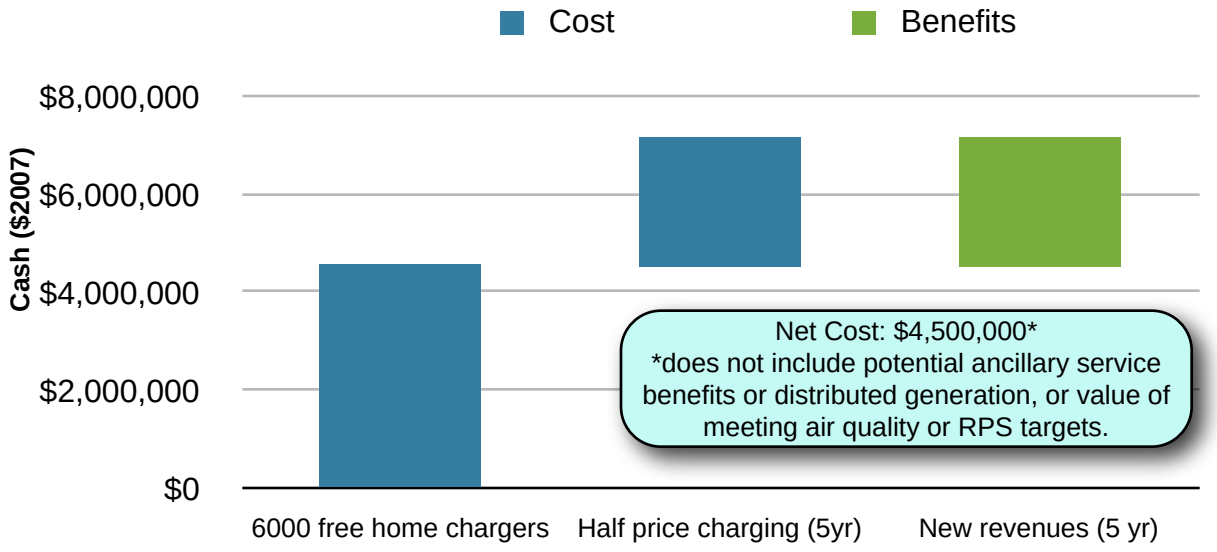
The utility has perhaps the most to gain financially in this new system (besides new businesses that emerge to serve plug-ins), and can provide funds, incentivized prices for electricity, and expertise in electrical connectivity to a plug-in ready community.

Action (with potential enablers)	Cost Benefit
"Must have" actions that ONLY utilities can lead	
Participate in local/regional stakeholder council that meets regularly to create the plug-in readiness plan, and check-in on implementation.	n/a
Provide free home charger/circuit installation for first 10,000 customers	-$4,500,000
Provide reduced-rate or free charging for 10,000 vehicles for 5 years	0
(we calculate revenues from 10,000 vehicles for an average utility to be ~$9M over five years)	
Tie free/reduced charging to "no charge" times or utility override power (though tiered rates should incentivize consumers to charge off-peak).	n/a
"Must have" actions that utilities OR another stakeholder could lead	
Sponsor 100 public charge spots in high-traffic zones and parking areas.	-$700,000
Commit to buy or convert 30 plug-ins over five years for corporate fleet.	$13,000
Contribute to education plan via cash, or using existing connection to customers.	-$100,000
Provide $3,000 plug-in purchase incentive to 10,000 customers.	-$30,000,000
Assign one staff member to be the "champion" of the regional stakeholder council.	-$40,000
"Nice to have" actions for utilities	
Install sub-meters (or Smart Grid) for plug-ins	n/a
Bundle plug-in purchase with a "green power only" utility contract and discounts on home solar, AMI installation, a smart grid upgrade, bike, bus pass, and/ or light rail pass to high-light plug-in role in the green lifestyle	n/a
Sponsor battery warranty program to share the risk and to reduce the near-term cost of advanced batteries	To come

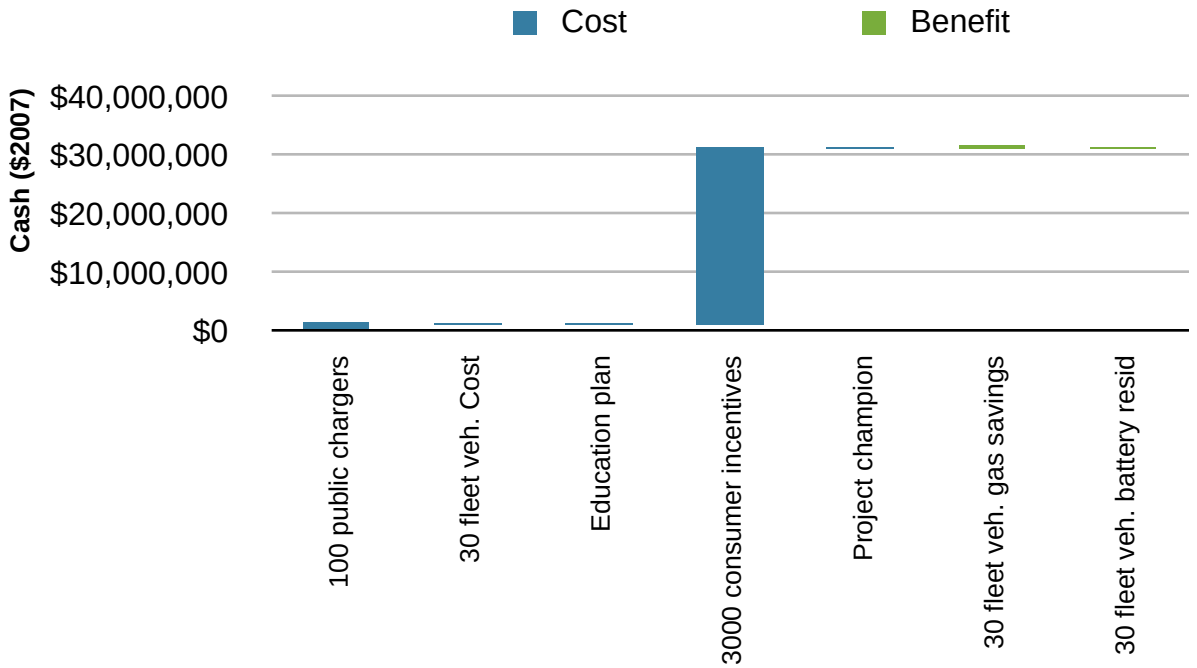
Utility: Business Case

Cost/Benefit for Utility Actions Over Five Years: "Must Have" Utility ONLY

Note: this does not reflect the fact that plug-ins offer new sales. IE: offering reduced rates "costs" the utility $14M, but the utility earns $14M in new revenue from plug-ins. This also does not reflect the potential ancillary service or load management benefits of plug-ins combined with Smart Grid.



Cost/Benefit for Utility Actions Over Five Years: "Must Have" Utility OR Other



Non monetized benefits:
Recognition as city leader in green technology, potential credit for CO_2-eq and criteria air pollutants saved from transport sector, leverage smart grid investments

Actor: Civic Groups

Project Get Ready, and the plug-in revolution, only succeed if consumers adopt plug-ins quickly. Civic groups, which connect citizens and act in the public interest, are a critical component of education, organization, and support.

Action (with potential enablers)	Cost Benefit
"Must Have" actions that ONLY civic groups can lead	
Participate in local/regional stakeholder council that meets regularly to create the plug-in readiness plan, and check-in on implementation.	n/a
Contribute to education plan	n/a
Provide a venue for interested citizens to register their intent to purchase an plug-in	To come
"Must Have" actions that civic groups OR another stakeholder could lead	
Sponsor public charge spots in high-traffic zones and parking areas.	~$7,000 per spot
Assign one staff member to be the "champion" of the regional stakeholder council.	-$40,000
"Nice to Have" actions for civic groups	
Provide plug-in "concierge" hotline to connect owners to trained mechanics, electricians, etc.	To come
Launch large scale marketing plan to highlight the "empowerment and fun" associated with plug-in while also highlighting energy use and security benefits, including heavy TV and radio advertising as well as website.	At least $2M
Develop materials to educate the drivers of tomorrow by reaching students of all levels (elementary- college) with related curricula	n/a

Civic Groups: Contributions

List of Potential In-Kind Donations: "Must Have" Civic Group ONLY

Please refer to page 5 for monetary costs associated with the following donations.

- Participate in local/regional stakeholder group: volunteer time, expertise, venues, convening power
- Contribute to education plan: volunteer time, expertise, money, citizen outreach tools/lists/other channels
- Venue to register plug-in vehicle ready citizens: volunteer time, website

List of In Kind Donations: "Must Have" Civic Group OR Other

- Sponsor public charge spots: money
- Project champion: 20 hours a week from one staffer

Actor: Local Businesses

Local businesses can provide three important functions in an plug-in-ready city: first, they can use their set of employees as an organizational unit; second, they can lend business planning expertise to the stakeholder council; and third, they can incorporate plug-ins into their own businesses, providing early demand. Since businesses range so dramatically in size and budget, we put forth these numbers as baselines, and recognize that different businesses should contribute in proportion to their size.

Action (with potential enablers)	Cost Benefit
"Must Have" Actions that ONLY local businesses can lead	
Participate in local/regional stakeholder council that meets regularly to create the plug-in readiness plan, and check-in on implementation.	n/a
Provide charging spots in parking deck, as an employee perk. *Larger business should aim for 30, Smaller businesses can provide one or two, as appropriate*	-$3,000 per spot with two outlets
"Must Have" Actions that local businesses OR another stakeholder could lead	
Sponsor public charge spots in high-traffic zones and parking areas (one for small businesses, five for large businesses).	-$7,000/ -$35,000
Commit to buy or convert 30 plug-ins over five years for your corporate fleet.	$13,000
Contribute to education plan.	-$100,000
Assign one staff member to be the "champion" of the regional stakeholder council.	-$40,000
Create "plug-in only" parking spots for customers (two for small businesses, five for large businesses).	-$6,000/ -$35,000
Large businesses give first 100 employees $3,000 incentive to purchase plug-in, small businesses give first five employees $500.	-$300,000/ -$2,500
"Nice to Have" actions for local businesses	
Provide greater incentives to employees, contribute to larger educational plan.	n/a
Technical education and worker transition assistance needed to rapidly train plug-in service technicians, encourage plug-in curricula in trade/technical and community colleges, as and create/fund modules in plug-in crash safety training for fire/police.	n/a

Local Business: Business Case

In the coming months, we will be developing a few business-specific cases, for example, the value to a retailer of having a high-profile charging station in their parking lot. In addition, we expect that business who get involved in Project Get Ready will have the following benefits:

- "Green" branding identity,
- Attract with early adopter consumers,
- Greenhouse gas emission reductions for employee commute,
- Early insight into the IT, entertainment, and other service opportunities associated with electrified vehicles,
- Better employee satisfaction, and
- (With a smart grid) potential for more demand response or energy storage capability, using blocks of employee/customer vehicles.

Actor: Other (Developers, Schools, Philanthropists, Dealers, Banks, Mechanics)

Certain specific businesses can contribute specialized skills, functions, and insight to getting their community plug-in ready. Of course, all local businesses should consider joining the stakeholder council.

Action (with potential enablers)	NPV in 5 years
"Must Have" Actions	
Developers: welcome, support and implement codes to make all new parking spots/ garages/driveways plug-in ready.	
Universities: contribute to consumer education programs	
Universities: buy 30 plug-ins for fleets	
Universities: build charging spots on-campus	
Universities: assign one staff member to who's job it is to keep the stakeholder council moving forward.	
Philanthropists: sponsor the "champion's" salary for the time they spend on this project.	
Philanthropists: sponsor individual public charging station installation (like park benches)	
Automotive dealers with banks: provide a mechanism to bundle all incentives as a direct rebate/cost reduction at the point of purchase.	
Automotive dealers with banks: set up special, low-rate financing for plug-ins.	
Local celebrities: drive an plug-in.	
State gov't (DOT): free highway tolls and access to HOV lanes for plug-ins	
"Nice to Have" actions	
Auto repair shops/electricians: train staff to service plug-ins, member of concierge service	
Automotive dealers with banks: set up special, low-rate financing for plug-ins.	
Banks/3rd parties: develop warrantee program for batteries	

Our assumptions can be explored by contacting the authors at smartgarage@rmi.org and visiting www.projectgetready.com. Gas was assumed to be $2.50/gallon. All numbers are estimates, provided to help communities estimate costs for getting ready, and will vary based on location and technology. Full community charters should verify these estimates with stakeholders in their own locality. All job numbers were created using the Bureau of Labor Statistics' national average job multiplier tables.

Web Resources

The Project Get Ready website provides users with a **searchable database** containing pain points city leaders may face, solution strategies to overcome those barriers and specific implementation tools needed to take action.

Users will have the opportunity to browse plug-in initiatives taking place across the globe for specific examples (such as: what are mechanisms for local governments to give vehicle rebates to consumers?) while also contributing their own ideas and experiences. Calculators designed to estimate the costs, revenue and jobs created in relation to specific actions based on local inputs are available, along with media kits and other educational documents outlining core plug-in technology details and why cities should get ready.

Contact Information

Project Get Ready is coordinated by the Rocky Mountain Institute, a 501(c)(3) based in Colorado.

Please visit our webiste: www.move.rmi.org

To contact the authors for more information or to become a technical advisor, please use the links at www.projectgetready.com, or write to smartgarage@rmi.org.

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