Boulder County Electric Vehicle Adoption Analysis: Key Issues in Charging Infrastructure and Optimum User Segment Targeting

Draft Scope of Work developed by Southwest Energy Efficiency Project – 2014

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Background

In 2011, the Southwest Energy Efficiency Project conducted an initial assessment of public electric vehicle (EV) charging infrastructure in Boulder County and made initial recommendations about potential additional development actions that could be taken to foster greater EV adoption and utilization.

Since that time, significant development has taken place in this sector. EV car sales have doubled between 2011 and 2012 and again between 2012 and 2013. In 2013, EV sales increased over 200%. This adoption rate is far faster than even the initial strong sales of hybrids like the original Toyota Prius. This growth has also provided an opportunity to study usage and charging patterns among EV adopters.

In a recent analysis by the DOE, important new insights have emerged about the role of EV charging and what charging options are most significant in fostering EV adoption and use in commuting. In a study called the "EV Project," DOE tracked 8,000 EVs and their users' charging behaviors. That study found that home based charging accounted for between 74-80% of charging, with the majority of the remainder taking place at worksites. A subsequent subset analysis of Nissan LEAF owners found that the availability of workplace charging more than doubled their off-site charging use. Public charging stations in both studies were only used 2-3% of the time. These findings have also been corroborated by cities like Copenhagen in which significant EV adoption and charging infrastructure development efforts have found that home and workplace charging have by far the biggest impact on EV adoption and use.

Another important feature of workplace charging is the potential for nearly doubling the driving range of an EV, making it suitable for commutes of up to 50 miles each direction. Given the significant challenges faced in reducing in-commuter single occupancy vehicle use—over 30% of Boulder's transportation GHG emissions—EV use by this travel group could be an important element of a larger multi-faceted/multi-modal solution.

Taken together, these findings suggest that at this stage of EV adoption, the most significant areas for focus on infrastructure may be on measures that facilitate greater charging infrastructure access and affordability at home and work locations, while incentivizing and reducing financial impacts to employers. Continued attention to public charging infrastructure will be important but likely confined to a more narrow set of potential settings than was previously imagined. Public charging could also be partially addressed by locations that function as both workplace and public charging such as Boulder's downtown parking garages.

One caveat – there may be a very different set of charging needs for electric vehicle carsharing. Because carshare vehicles are not stored at a home or worksite, they will likely need access to a different set of charging stations. Electric carsharing may fit very well as a strategy that helps to both reduce VMT and reduce GHG emissions, but also exposes more people to electric vehicles and increases the chances that if carshare members do acquire a vehicle it will be an EV. Carsharing is expected to be especially important for younger generations. Over the last decade 16 to 34 year olds has dropped by approximately 25% while transit and cycling are up 40% and 24% respectively over the same period. As they are less reliant on cars, the younger generation is also much less likely to own their own vehicle, meaning that services like car sharing will likely play a greater role in filling their more limited demand for vehicles.

In addition, in the near future there will be a round of EV deployment competitive grants from the DOE that will focus on EVs in car rental and carshare, so this may be a high priority in the short term to do analysis that could help the Boulder area position itself for a competitive application.

Other types of electric vehicles may also play a role in shifting transportation patterns in Boulder. Electric bikes and electric assist bikes may fill a niche for those commuters who are not interested in a regular bike commute or transit but are willing to not drive their car. They may also help make last mile trips more amenable to a larger population. As more electric motorcycles become available these may also replace regular gasoline motorcycles.

Relevance to Boulder Area Public Institutions

In its recent analysis of the city of Boulder's transportation emissions, city staff identified three major findings that have direct relevance to EV adoption and use at both the city and larger County/area basis.

Critical role of energy source change to achieve deep GHG reductions -- First, the analysis indicated that VMT reduction and improvements to vehicle efficiency due to the CAFÉ standards could achieve about 60% of the GHG goal, and that additional efficiency improvements and transportation energy source change will be necessary to achieve up to 40% of the reductions necessary to achieve deep GHG emissions reductions currently being considered as a city-wide goal[1]. Personal vehicle fleet source switching will be a significant element of this change over.

Employee in-commuters as a major potential target -- Second, as noted above, employee in-commuters represent over 30% of the City of Boulder's GHG emissions and are similarly significant for the County, CU, BVSD and other large employers in the area. 80% of these in-commuters typically drive alone, a proportion that has been very resistant to significant change. It is also this type of traveler that could reduce their commuting costs by 50-80% due to the much higher efficiencies and lower cost/energy unit of electricity versus petroleum (potentially $0 fuel costs if the EV owner has a home PV system).

Optimizes last mile solution opportunities – By controlling and directing employee commuters to certain locations for EV parking and charging, institutions and businesses can also customize last-mile solutions from that point to work site locations. This could include transit, bike/walk or even electric bike options.

Based on both recent evolution of EV adoption and use and these related transportation issues and priorities, a coordinated effort to develop targeted actions among multiple major institutions—the City of Boulder, CU, Boulder County, and BVSD—could create a critical mass for larger scale adoption of EVs in ways that could further catalyze greater adoption throughout the rest of the larger community. To achieve this objective, we recommend the following three priorities for a second phase analysis. This analysis would focus on both charging development and other actions that would enable public institutions to lead this transition in ways that also bring substantial benefits to their employees.

Priority 1: Workplace charging

Focus #1—Identify key actions to provide effective workplace-based charging.

Identify best practices for encouraging employers to provide their employees access to charging stations-

- Identify the appropriate level for workplace charging (Joe C. indicated Level 1 may be sufficient-we generally agree)

[1] The city is currently considering an 80% reduction in GHG emissions below 1990 levels by 2050 (or sooner).

- Show the cost benefits of Level 1 vs Level 2 including potential demand charge savings
- Try to identify best practices around what is the 'right' amount of workplace charging, such as the best number of charge ports per employee
- Talk with selected major private sector employers to discuss opportunities and barriers to charging/promoting EVs to their employees.
- Review potential regulatory options for EVs in building codes, development review and TDM planning in other communities, and outline conceptual options for Boulder.
- Develop case studies that could be used to encourage employers to participate in workplace charging, and EV materials that could be used by commercial energy advisors participating in EnergySmart.
- Identify what local governments can do to encourage/incentivize workplace charging in the private sector.
- Identify any best practices for workplace charging for E-bikes, especially as how they might differ from regular vehicle workplace charging.

Focus #2--Analyze potential programs focusing on promoting the adoption of EVs by the employees of the participating institutions (the City of Boulder, Boulder County, CU, BVSD)

- Work with the City, the County, BVSD and CU Boulder to analyze the commuting patterns of their employees and identify what populations would be most appropriate for EV adoption.
- Outline the business case for employees purchasing an electric vehicle and home solar based on commuting distance
- Develop EV and EV/PV materials that could be used by residential energy advisors working with EnergySmart
- Outline potential incentives that employers could offer employees
- Explore potential opportunities to partner with local financial institutions to finance EV/PV/home efficiency packages
- Show what the GHG and economic benefits could be from this program
- For each employer, outline what a workplace charging program might look like, for example: how many stations, what level of charging, costs, security concerns, O&M costs, equity concerns with non-EV drivers (who maybe charge their I-phones at work)

Priority 2: Residence-based charging

Focus Area #1—ID and describe best practices to facilitate home charging

- Building codes and other best practices- systems
- Financing mechanisms
- The business case for EV + PV adoption by commuters Broadening outreach strategies (for example, incorporating EV/PV into residential EnergySmart)
- Identify the current adoption rates for solar PV systems

Focus Area #2--ID and describe best practices to get new multi-family and commercial buildings to install during construction?

- Provide options for incorporating workplace charging requirements into building code, rental licensing requirements, and into the development review process.
- Financing mechanisms

Priority 3: Carshare charging (

Focus Area #1—ID and describe best practices for electric vehicle carsharing

- Review Las Vegas and Indianapolis models

Focus Area #2—Analyze potential number and locations of charging needs for expanded EV carsharing

Priority 4: Public Charging

Focus Area #1—Evaluate existing and potential placement of public charging infrastructure

- Update analysis of existing public Level 2 chargers County-wide. Identify areas that appear to have sufficient existing charging.
- Identify the highest trafficked/highest destinations areas of the City/County and see if these places are already served by EVSE.
- Evaluate provision (or lack) of charging at city managed shared parking structures and RTD park-n-rides and identify best candidates for public charging in these two areas.

If the initial analysis indicates that additional charging would be beneficial, additional analysis would identify the best sites for more public charging. This would use traffic data from DRCOG and the City/County to identify the areas with the most vehicle traffic that are not already served by EVSE.

Focus Area #2—Evaluate best locations for DC fast chargers.

A related analysis could be done to try to determine optimal siting of DC fast chargers. This would look more at regional trips into (and perhaps outside of) the City/County. This might include analysis of the pattern of recreational travel from Boulder County, and look at potential charging locations to serve this travel.

Priority 5: Project Future EV Adoption Focus Areas

A final analysis could be conducted to analyze demographics of the next expected wave of EV adopters and how does that relate to the population in the city/county taking into account the changing travel behavior of younger and elderly populations.

Project Coordination

The city will convene a coordination/steering group which will meet periodically to review progress, provide feedback, and coordinate outreach and communications.

Final deliverable

There will be a final written report including an executive summary, a set of prioritized recommendations including potential early action items, and detailed analysis for each of the task areas. In addition, we will prepare a powerpoint presentation based upon the executive summary.