Inland Empire Regional Mobility Dialogue Series

Results and Summary





Jack H. Brown College Business and Public Administration





Improving the Electric Grid and Infrastructure to Meet the Needs of Electric Vehicles

Aug 27, 2019

Introduction

As the number of electric vehicles (EVs) begins to rise, there is a strong push towards the electrification of our transportation infrastructure. Utilities will have to effectively model their performance and incentivize charging behavior for both the general public and business sector. According to Electric Light and Power, electric vehicles are projected to exceed 18 million vehicles by the year 2030, or an estimated seven percent of the total vehicles – cars and light trucks – on the road (www.power-grid.com).

As millions of EVs increase their demand for power and connectivity to the grid, what are the challenges that will be encountered by the utilities and planners? This dialogue focused on how we can improve our electric grid system and infrastructure to meet the growing needs and demands of EVs. We heard from two experts on the subject:

- Lisa Hannaman, Senior Account Manager, Southern California Edison
- Loreana Marciante, Senior Emerging Mobility Solutions Engineer, HNTB Corporation

The main takeaways from this Dialogue included ways to improve the electric grid and infrastructure to meet the needs of electric vehicles. The simple fact is that in order for EV owners and the consumer to have confidence in their ability to get to point A from point B, there needs to be sufficient charging infrastructure. In addition, we learned that policy has an important role to play in order to transform this market and the steps that Southern California Edison is taking to implement EV charging infrastructure.

Loreana Marciante, Senior Emerging Mobility Solutions Engineer, HNTB Corporation

HNTB Corporation recently welcomed Loreana Marciante to their team. Loreana specializes in advanced technology programs and works with zero emission vehicle programs across the country to enhance HNTB's partnerships with leading technology solution providers. She has two decades of experience in urban design, with a focus on transportation innovation and sustainable development. Loreana led the discussion by looking at different emerging mobility technologies and how they are shifting the transportation infrastructure. For this specific dialogue, Marciante focused on ways to improve the electric grid and infrastructure to meet the needs of electric vehicles (EVs).

"I am going to very briefly talk about electric vehicle technology and market trends, a little bit about government activity, and the charging infrastructure technology and business models, which is really an interesting piece of this conversation," said Marciante. Electric vehicles are different in that they do not operate using an internal combustion engine. Hybrid electric vehicles can be plugged in to charge and also use gasoline.



Then, there is the fuel cell electric, which is a hydrogen vehicle, but it also uses an electric motor. "When we talk about electric vehicles, we talk about all of those, but most of the regulations really focus on

plug-in electric vehicles (PEV), which is what most people are focused on when we are trying to maximize electric mileage," said Marciante.



Another aspect to consider when thinking about electric vehicles is consumer choice. There were only four models of EVs to choose from in 2008, they were not in high demand. This number has grown now to 65 electric vehicles models in the United States. It is a little different for residents of California due to state regulations, there is more variety available. In other areas of the country, there are not as many models to choose from.

EV technology is all about the battery. The

cost of batteries have been reducing very rapidly from 2010 to 2018. This is mainly because of industrial capacity and improvements in the manufacturing process, so it is not necessarily new technology, but rather the ability to scale up production. "Many experts think that when we hit 100 dollars per kilowatt hour, that is when you get price parity with an internal combustion engine vehicle of the same class. Now when I say price parity, that is to start off, the price of the vehicle when you purchase it," said Marciante.

When examining the demand for electric vehicles across the world, China has experienced significant growth in recent years and that is based on an aggressive policy. "A lot of the growth that I am going to show you soon in the United States has come from California, because policy matters, it is what is driving a lot of the business," said Marciante. Right now, the world share of electric vehicles is roughly 2.2% of new sales. The transition to a fully electric vehicle market will take time, as vehicles are normally rotated through the market every 7 to 14 years. While EV growth in the United States is increasing, there was a significant jump in 2018 and that was primarily attributed to the delivery of the Tesla Model 3. California is ahead of the game and will more than likely be the first state that experiences mass market deployment.





According to the Bloomberg New Energy Finance Projection, which is one of the most aggressive projections, it is estimated by 2030 we will be at 30% of new sales will be EVs. By 2040, about 50% of new sales will be EVs. This is one of the most high-reaching projections out there, and it still is not enough. "By rule of thumb, we have to estimate that by 2030, 100% of vehicles sold must be electric, so that we can meet Paris agreement targets and climate stabilization targets," said Marciante. Even though we are experiencing tremendous growth in the market, it is still not nearly enough for what it will take to beat climate change.



The charging infrastructure is the most interesting and complex component when working with EVs. There are three levels. Level one and level two are AC (Alternating Current), using 120 volts, which is equivalent to a regular household outlet. Level three is the DC Fast Charge. "When you start talking about 208 or 480, you start talking about high amperage of up to 50 kilowatts of DC Fast Charge. Electrify America has announced that they

are going to go up to 350 kilowatts, now you are talking about a different animal," said Marciante. This brings up safety concerns as there is an infrastructure limit on how quickly vehicles can be charged. Ultimately, the ideal scenario would allow for consumers to charge their vehicles in roughly 20-30 minutes. If this is the case, how would that change our patterns as consumers? We would no longer be stopping at gas stations to fill up in five minutes, we would be stopping for 20-30 minutes at a time. This changes the current landscape of your local gas stations. Gas stations would expand the amenities offered to customers, because the consumers will be stopping to browse for longer periods of time.

Another component to think about is, where will these stations be located? More than likely they will be placed near shopping malls and restaurants to further benefit the consumer. "Most people will probably not use that option. They are going to use home charging for the most part, but we know consumers, why are there four charging stations in one single corner? We want convenience," said Marciante.

There are a lot of possibilities that will come with EVs, and one of the biggest challenges will be predicting the future. There are multiple models by infrastructure companies that are not profitable yet. With retail and worksite charging infrastructure, the focus is on the host site. This entails a company or organization that is able to host the equipment and consider themselves the network operators. They do not own the charging infrastructure, this is held by



another company, but the host operates it for a profit.

Shell Gas Stations are buying Greenlots and installing quick charging infrastructure into the stations. "They are thinking of themselves as an energy provider and providing the experience within the gas station model. And then you think about Shell, they really have been one of the companies that has gone through that convenience store model across the world," said Marciante. Shell has built their stations on the concept of retail and now this is an opportunity for them to grow that line of business even further. Next, we see car manufacturers who are moving forward with their own charging infrastructure models, such as Tesla and Proterra.

For the home charging infrastructure, there are a few models. For example, Volta's revenue plan includes media sales as a part of the charging infrastructure. Electric utilities also have a role in all of this. Marciante believes that California utilities have the best regulatory structure to test and pilot these charging stations. Other state utilities are tied by their commissions and do not have the same flexibility. "Everyone is always looking at California to see what they are doing and what they should do next," said Marciante.

The International Council for Clean Transportation did an analysis that is based on the charging infrastructure in 2017, as a percentage needed by 2025. In the accompanying figure, if you look at the Riverside, San Diego, Los Angeles, and Las Vegas areas, they are in red. This signifies that the current infrastructure is not going to meet the needs of the growth projections of their market. Then, there are areas such as Kansas City who are in blue. These blue



areas are where the utility companies have invested a lot in charging infrastructure ahead of market development.

"The vehicle to grid technology is sort of the Holy Grail of making sure this infrastructure exists," said Marciante. We have to start thinking about EVs not being a load, but being better for the system. Currently, Nissan is the only company that has the vehicle to grid technology. "There are a lot of things to still figure out with this technology, but it offers so many interesting solutions in building energy management systems for micro grids. If we can really figure out a way for EVs to share the load and to becomes storage systems, then it is a whole different ball game," said Marciante.

Lisa Hannaman, Senior Account Manager, Southern California Edison

Our second guest speaker leads oversight and partnership with the State of California Portfolio for Southern California Edison. Lisa Hannaman is a Senior Account Manager for Edison's Business Customer Service Division. She is also the co-lead on the first ever Clean Energy Greenhouse Gas (GHG) based incentive program available to a customer base. "When we start to talk about regions and we start to talk about the State of California and the various impacts when we look at transportation, you have to look at it from various perspectives," said Hannaman. The biggest issue is the impact of vehicles on clean air in California. A striking percentage to consider is that 82% of NOx (nitrogen oxides) emissions are caused by these mobile resources.



According to Hannaman, there are several barriers in California to the incorporation of EVs.

- 1. Range anxiety there are a lot of people on the road in California. People need to have the necessary charging stations to get from point A to point B.
- 2. The cost of infrastructure and marketplace barriers whether that's home charging, commercial charging, etc.
- 3. Electricity rates or what is it going to cost per kilowatt hour. Are there agencies or funds to help subsidize the charging rates?



Policy is necessary to transform this market in California. Governor Newsom wants to invest nearly \$400 million dollars into infrastructure, electric vehicle rebates, and into the education of where we need to go so that customers can start implementing these electric transportation strategies.

Edison has started a pilot program called the Charge Ready Program.

As a part of this pilot, Southern California Edison has installed approximately 1,000 charging stations in their territory. Edison paid for the infrastructure up to the stub for the chargers. The customer then paid for the chargers directly with a possibility for a rebate. SCE is hoping to expand on this through a phase two. They have filed with the California Public Utilities Commission to begin phase two for light duty vehicles. From a grid perspective, there is a need to integrate 20 times more vehicle charging stations than what we have today. The overall goal is to aim for demand neutrality – users will not pay demand rates for those charging stations, they will only pay for the usage of the chargers. "We basically turned our peak upside down. It used to be that 12:00 PM to 6:00 PM was the peak in California – that's when

we were using the most electricity," said Hannaman. Then, solar came into the picture, and now the peak is from 4:00 PM to 9:00 PM. This has completely changed the strategy of how customers charge.

Two important agencies related to this effort are the California Air Resources Board (CARB) and the California Energy Commission. They are providing funds and working on the low carbon fuel standards – looking at emissions factors, the cost of the conversion from gasoline to an electric vehicle, and miles

driven. These are all factors that SCE is looking at and utilizing. "So, when we looked at our electric transportation pathway, our clean energy pathway had several components. We were looking at 80% of our electric grid being emission free by 2045," said Hannaman. Moving this into the transportation sector, the goal is to have 24% of light trucks and cars, 15% of medium-duty trucks and vans, and 6% of heavy-duty trucks and buses on the road with electric drive trains by 2030.



A key aspect of this is increasing the number of medium and heavy-duty vehicles. "For heavy-duty vehicles, the market is transforming. The availability of those technologies are either here or coming, and now it is just really looking at our pathway and where can the utility support that effort," said Hannaman. The two major components to support these efforts is grid integration and infrastructure. Throughout the United States, 77% of approved electric vehicle investment has been in California. What the utility companies are doing in California are well ahead of the rest of the country. Southern



California Edison is trying to accelerate electrification across multiple sectors, and when you look at the different sectors out there, it all really starts with the heavy- and medium-duty space. From the utility's perspective, there are roughly \$356 million dollars to spend on infrastructure and the goal of this spending plan is to help customers transform that space.

The last piece of this is at home charging, offering customers rebates to charge. "As Loreana said, if you are charging 6 o'clock at night and that's our peak, you're probably going to be dinged harder than those customers that are willing to strategize and start at 9 o'clock at night or start at midnight," said Hannaman. The idea is to look at these different strategies and the consumer mindset to figure out where we are going in building out the infrastructure space.

Moving the Dialogue Forward: Ideas from the Participants

After the presentations, the Dialogue attendees discussed the ideas presented and worked together in groups to discuss solutions to move it forward. The top three ideas from each table have been categorized and summarized below.

Engaging utility companies. The speakers and many of the participants discussed the role the utility companies have when it comes to preparing the grid.

- It is important to get the utility companies involved early on in the game so the infrastructure is set in place for the switch to electric.
- There is a ton of money with the utilities for the electric space.
- Utility companies can offer incentives for people to make the switch to electric, which is why it is a good idea to involve them early on.

Opportunities and planning. Many of the attendees were brainstorming the new possibilities and overall changes that will take place to meet the needs of EVs.

- We need to brainstorm on how to get policy makers to move initiatives forward.
- EV's can also be used to manage peak demand for energy by putting charge back into the grid during the evenings.
- Transit is struggling to meet mandates, but no one is writing checks. The only option is to cut service.

Is this goal achievable? Some of the groups voiced concerned over the new mandates and were wondering if they can be met and how do we move forward.

- How achievable are some of the goals that were set by the state?
- What will be the future scenario with full EV deployment?
- Cost of vehicle electrification will be borne by taxpayers.

The Leonard Transportation Center (LTC) at California State University San Bernardino (CSUSB), presented a bi-monthly dialogue series on topics relevant to the future of transportation in the Inland Empire. The series, which was open to the public, was sponsored by HNTB Corporation and was held every other month starting in February 2018.

Dialogue topics ranged from understanding the current mobility dilemma and its causes to potential solutions like congestion pricing, transit; emerging technologies such as autonomous and connected vehicles and new ways of funding transportation infrastructure. Attendees had the opportunity to hear from transportation experts and engage in vigorous discussion about the transportation challenges facing the Inland Empire.

About Leonard Transportation Center

The Leonard Transportation Center (LTC) at California State University, San Bernardino opened in 2006 with a focus on regional transportation needs. The vision of Bill and Barbara Leonard was to create a center that focuses on the unique transportation opportunities and challenges the Inland Empire faces. Today, the LTC is working to expand its research and student engagement programs. Focal points include transportation management and governance issues, development of new technologies, and transnational studies. Their vision is to work collaboratively to seek solutions to assist residents, businesses, government and nonprofit agencies, and international partners to work together on improving sustainability and quality of life in the Inland Empire. For more information, visit www.csusb.edu/ltc.

About HNTB

HNTB Corporation is an employee-owned infrastructure solutions firm serving public and private owners and contractors. HNTB's work in California dates back to its founding in 1914. Today, HNTB continues to grow in size and service offerings to clients in California from seven office locations, currently employing more than 350 full-time professionals. With more than a century of service, HNTB understands the life cycle of infrastructure and addresses clients' most complex technical, financial and operational challenges. Professionals nationwide deliver a full range of infrastructure-related services, including award-winning planning, design, program management and construction management. For more information, visit <u>www.hntb.com</u>

About San Bernardino International Airport

Conveniently located in the heart of the Inland Empire, close to major freeways and just 60 miles from Los Angeles, San Bernardino (SBD) International Airport is strategically positioned to meet growing aviation activity, including cargo, business aviation, general aviation, and commercial airlines by providing competitive rates for aviation companies and local businesses looking to stretch their wings and expand their horizons. With extensive stretches of pristine runway and acres of prime land available for aviation development, SBD International Airport is ready to help our community and region reach new destinations.