POWERGRID INTERNATIONAL

The largest public charging station in the US showcases the challenges facing developers and utility owners—and the potential for future growth

BY MIKE VOLL AND WICUS POSTMA | 9.8.20

To aid in California's transition towards clean energy and keep up with the increase in demand for electric vehicle (EV) charging infrastructure, the City of Pasadena has just opened the largest public charging station in the United States. The newly designed Marengo Charging Plaza consists of 44 'fast' chargers that are capable of charging vehicles in approximately 30 minutes.

Typical charging stations have approximately four charging units at any given location. But the Marengo Charging Plaza has 10 times that many. This is a remarkable development for the Energy industry because it showcases how to design mass charging infrastructure in dense urban areas.

As to be expected, installing more EV charging stations demands more space, more power, and more infrastructure. These requirements are producing several challenges for developers and utilities providers as the size and popularity of charging stations increase—especially as we move towards the mass electrification of public transit and fleet vehicles.

So, how can cities plan for the proper implementation of large charging infrastructure in urban cores?

Challenges associated with charging station projects

As we look to implement electric vehicle charging infrastructure in communities across the US, we are asking ourselves several questions. How can we power it? How can we pay for it? Where in the world are we going to install it? There is no "one size fits all" solution for charging station projects—each community has unique wants, needs, and conditions. It takes an in-depth analysis and robust engagement process prior to planning a project.

One of the biggest challenges facing urban planners when building a charging station is the integration to the grid. This includes considerations for:

Power source:

- Can the utility provide the required power capacity or are significant upgrades required?
  - ◊ Is there a plan to incorporate renewable energy into the charging solution?

Cost:

- What is the anticipated cost of power to service the station?
  - ◊ What will the demand charges be for a new station that is not highly utilized?
  - ◊ How will the cost of the charging infrastructure and utility upgrades be recovered by charging activity?

Location:

- Can the station be located close to available power or does the location render it underutilized?
  - ◊ Are there permitting or land use restrictions prohibiting charging infrastructure in certain urban centers?
  - ◊ Are there amenities located nearby that will attract charging customers so that they have something to do while they wait for their vehicle to charge?

Special Circumstances:

- Can the charging station function as a microgrid to provide charging services during a utility outage?
  - ◊ Should battery storage be collocated at the charging station to reduce demand charges and potentially reduce grid impacts?

Should the charging station be collocated with other public infrastructure (e.g. telecom towers) to share permitting and infrastructure construction costs with other stakeholders?

Accessibility:

- Are EV accessible parking spaces required? If so, what codes and regulations apply in the project jurisdictions?
  - ◊ Are van, ambulatory, or drive-up accessible parking electric vehicle spaces required? If so, how many and where can they be located?
  - ◊ Can the accessible parking spaces be connected to an existing accessible route to the building entrance or site boundary?
  - ◊ Will Division of the State Architecture (DSA) approvals be required?
  - ◊ Do EV accessible parking spaces require specific signage or identification?

The newly designed Marengo Charging Plaza consists of 44 'fast' chargers that are capable of charging vehicles in approximately 30 minutes. *Credit: Marengo Charging Plaza*

By adding additional distributed energy resources and energy storage to a charging cluster, the station can form the hub of a microgrid. *(Project: NSPI Microgrid)*

Moving beyond the electric car: Charging fleet vehicles

For most people, charging stations for personal vehicles are becoming a common sight—there are almost 25,000 charging stations in the US alone. But where do we go from here? How can we plan for growth?

The next wave of electrification will likely include large freight vehicles like semi-trucks, public busses, and even ferries. And the move towards these kinds of electric vehicles is not far off. The State of California, for example, is trying to do their part by implementing a mandate for 100% zero emission buses by 2040. If developing charging infrastructure for 44 personal vehicles is a challenge, how are we going to be able to facilitate charging for hundreds of electric buses?

Some examples of the challenges these bring to the grid are:

- A typical transit garage converted from CNG or diesel to battery electric buses will require over 10 times the power to charge these buses! The connection to this facility now looks like a small substation rather than just a basic distribution feeder.
- Transit facilities are typically located in urban centers where they have little room for expansion. Imagine having to add a new transformer substation, a bank of energy storage batteries, and solar panels to one of these sites. Where will everything go?
- What happens during a utility outage or critical event? Electric buses still need to be charged when the grid is down. What type of backup power will be needed and where will these generators go?

Planning and moving forward

As we move further into the future, the development of charging infrastructure will begin to adopt new elements and technologies. How can developers, utility providers, and city planners prepare for growth and future innovation? By considering the following technologies:

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- **Microgrids:** Can a mass charging cluster be the hub of a microgrid? By adding additional distributed energy resources and energy storage to a charging cluster, the station can form the hub of a microgrid. This will serve not only the charging stations but potentially other buildings located within the community.
- **Hydrogen:** The transition to larger zero emission vehicles will be served by both battery electric vehicles and hydrogen fuel cell-based vehicles. The infrastructure to produce, transport, and dispense "green hydrogen" will require advanced planning and integration with the region's Integrated Resource Planning (IRP). Cooperation with renewable energy developers to harness otherwise curtailed renewable energy from solar and wind to produce green hydrogen will need to be explored.
- **5G:** As smart cities evolve their value propositions to include new services like shared and autonomous mobility, the need for high throughput deterministic networks will increase. Collocation of these new cell towers with planned EV charging infrastructure may make sense during early planning stages—rather than trying to implement them after-the-fact.
- **Battery storage/solar farms:** As previously discussed, the global EV market boom has had the side benefit of driving down the cost of battery energy storage since the same cells used in EV's are used in stationary battery storage. This allows the use of this technology to reduce demand charges, smooth the effect of mass ERV charging, and ease grid impacts. Solar power is also a natural complement to EV charging, especially for fleets since their charging cycles often match the daily solar production profile.

A fully charged future

As city planners, developers, and utility providers strive towards a more sustainable future, green technologies like electric vehicles need to be part of the plan. And personal electric vehicles are just the tip of the iceberg.

More communities will be seeking out solutions for electric vehicle charging infrastructure in the years ahead. City planners need to know the challenges ahead of time so that they can plan accordingly.

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