EPRI ELECTRIC POWER RESEARCH INSTITUTE

Future Proofing Charging Sites
Steps to Take to Prepare for Public and Workplace Charging

Future proofing charging sites is a best practice. As the number of electric vehicles (EVs) increases, public and workplace charging infrastructure will need to expand to meet consumer charging needs. Charging infrastructure expansion options can include increasing the number of charging stations and/or upgrading to higher power chargers.

Future proofing refers to incorporating features in a charging site's initial design that will provide the opportunity for expansion while mitigating potential future upgrade costs. Both the utility and utility site customer can take steps to incorporate features so that future infrastructure can successfully and efficiently be implemented.

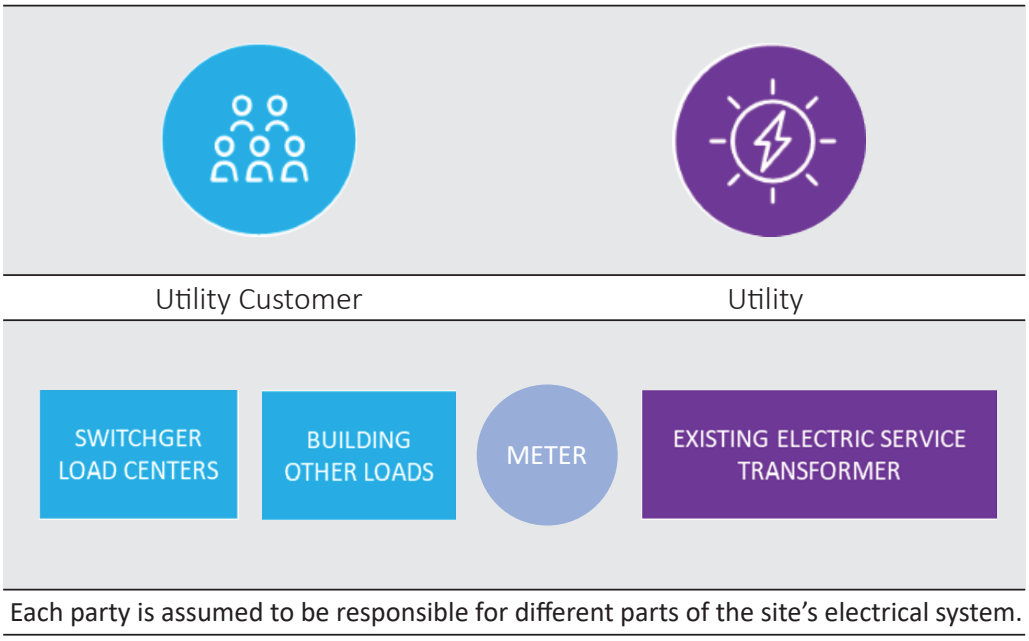

Figure 1. Future proofing

Proper design, construction, and installation of new facilities should include consideration of future site needs and capacity. Future expansion costs can be reduced if sites are designed to be able to handle expanded port counts, higher voltage charging, and higher power charging from the start.

There are four (4) of categories of future proofing measures that can be taken by the utility and utility customer: construction, electrical equipment, utility services, and hardware.

FUTURE PROOFING CATEGORIES

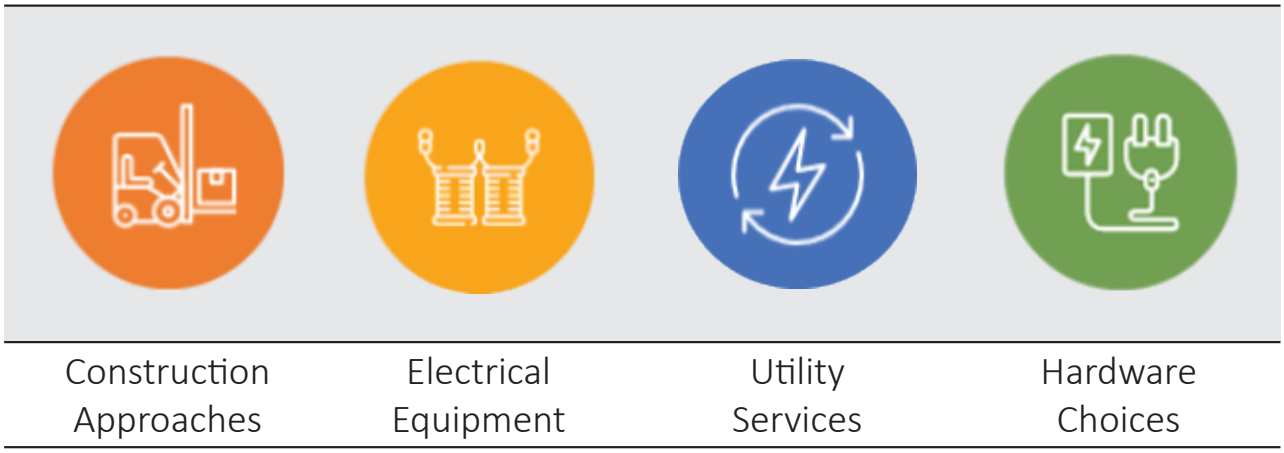

Figure 2. Future proofing categories

According to Pacific Gas and Electric, future proofing can increase initial costs between 12% to 20% over standard construction practices. In comparison, upgrading a system that was not future proofed can amount to almost 40% of the initial construction costs.

NOTE: This is not a comprehensive list of future proofing steps that can be taken for most, if not all, charging sites. All possible actions that can be taken for future proofing go beyond this document. Other steps can be taken by utilities or customers depending on:

- Local policy: Local policies have been implemented throughout the U.S., some of which can require future proofing, specify steps to take, and necessitate other planification processes. In some cases, policies may not exist. Each customer and utility is responsible for ensuring compliance with local and state policies.
- Future EVs: Currently, most EVs are smaller vehicles but larger EVs will be part of the market share in the future. These larger EVs – such as pick-up trucks – will not fit in compact charging stations; hence, reconfiguring parking layouts is something that can be prevented by future proofing.
- Other: Not all steps and considerations in all four categories (construction approaches, electrical equipment, utility services, and hardware choices) were explored. There are creative solutions that can be adapted to unique sites.

> "A modest investment made during construction can result in significant savings for future expansion."
> *– Watson Collins, EPRI*

Construction Approaches

- Up-size conduits (customer and utility)
  Conduits carry wires and as power and port counts increase, the size and count of the wires will also increase. Upgrading charger capacities and/or adding additional DC chargers will require larger conduits. When installing a conduit, upsizing it can help prevent additional trenching costs and reduce construction time. If up-sizing is a challenge, consider installing an extra conduit.
- Up-size concrete pads (customer and utility)
  Concrete pads support electric service and charging equipment. As more equipment or higher capacity equipment is installed, larger concrete pads may be needed. Both the utility and the site host infrastructure may be impacted. Up-sizing the concrete pads can prevent additional costs and reduce time of construction.

- Create clear construction contracts (customer and utility)
  Clear communication with contractors is essential when oversizing or adding extra materials that are for future proofing. Making sure that written agreements clearly delineate future proofing requirements can help prevent misunderstandings, mistakes, time, and costs.

Electrical Equipment

- Use electrical panels that accept 600A or larger devices (customer)
  Using large electrical panels with extra space to accept 600A or larger devices (cables and circuit breakers) prepares for future high voltage DC chargers.
- Leave spare breaker positions (customer)
  Circuit breakers correspond to electrical components that allow for chargers to operate. As more chargers are needed, more breakers will be needed depending on expansion plans. Allowing for spare breaker positions eliminates the need to install larger panels to support an expansion.

Utility Services

- Ask for a minimum of a 400A service from utility (customer)
  Less than 400A services typically have overhead electrical and metering equipment. If the 400A service is not implemented initially, there needs to be two construction upgrades (utility service and metering) in order to move to a 400A or greater service. A 400A service has equipment on the ground that will be needed to provide power to the additional DC chargers.
- Ask utility for future proofing programs (customer)
  Some utilities have programs that include future proofing considerations. These programs save planning time since steps to future expansion might be outlined by the utility.

Hardware Choices

- Choose ethernet cables instead of wireless (customer)
  Wireless connections can save space and reduce cable counts, but connectivity and cybersecurity issues can still arise. Ethernet cables can be used instead to connect networked equipment to the modems and avoid connectivity and cybersecurity issues.
- Ensure interoperability for networked chargers (customer)
  Making sure that current networked chargers can flexibly communicate with alternate charging networks is essential. Companies might go out of business or a consumer may want to integrate other brands into their charger mix. One way to prevent re-purchasing chargers and increasing interoperability is ensuring they are Open Charge Point Protocol (OCPP)[1] certified. The certification allows for charger/network communication regardless of brand.
- Consider DC chargers that accommodate higher voltage charging (customer)
  DC chargers support varying output voltage levels and capacities. Installing DC chargers that have higher voltage capacity (generally in the 900 to 1000Vdc range) allows for better accommodation of future vehicles with higher voltage capabilities and speed of charging. This can help in accommodating larger EVs and/or future EVs.

[1] https://www.openchargealliance.org/certification/.

SUMMARY

Actions can be taken to future proof a site for future expansion. Plans to do so must exist for both the utility and the customer, and clear communication is essential between parties to coordinate future proofing efforts. The utility/customer agreement should clearly delineate future proofing responsibilities. Remember: communicating needs, sharing plans, and strategizing together can help facilitate the future proofing of charging sites.

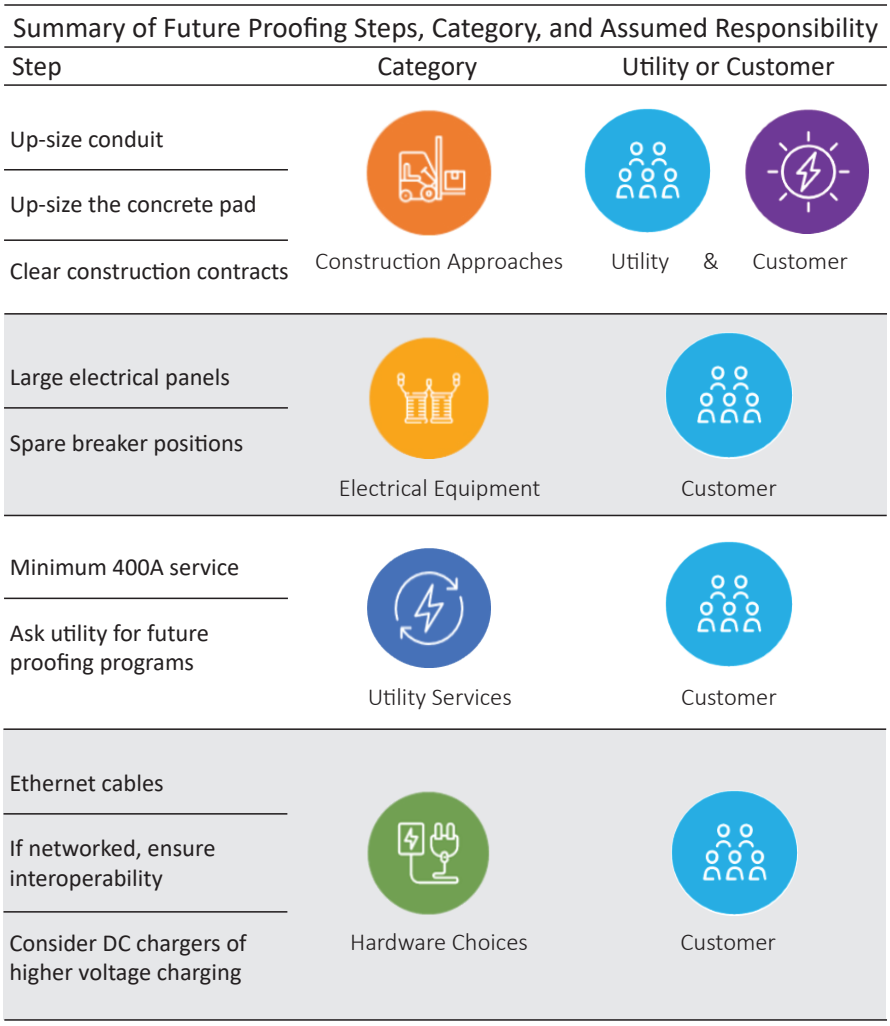

Figure 3. Future proofing steps, category, and assumed responsibility

ACKNOWLEDGMENTS

This report describes research sponsored by EPRI.

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This publication is a corporate document that should be cited in the literature in the following manner:
Future Proofing Charging Sites: Steps to Take to Prepare for Public and Workplace Charging. EPRI, Palo Alto, CA: 2021. 3002022362.

3002022362 June 2021

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