ELECTRIC VEHICLE INFRASTRUCTURE

Interoperability best practices
Testing and validation checklist

Interoperability is a major enabler for scaling electric vehicle charging infrastructure across every e-mobility use case.

However, the plug and play benefits of interoperability do not happen without proactive and collaborative development, testing and validation among EV industry technology leaders.

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Widely deployed open charging standards include CCS and CHAdeMO, seen here on Electrify America's network. The CCS standard boasts the highest number of compatible EV makers in North America and Europe.

Standards and Interoperability
The mission of interoperability offers the entire EV industry a framework of shared benefits including safety, scalability, savings, security and simplicity. These advantages range from consumer safety assurances and supply chain mobilization to highest vendor choice and infrastructure asset utilization.

Charging standards provide an essential recipe to move the EV industry forward faster, but the ingredients listed in a standard are just the beginning of interoperability excellence. How standard is interpreted, implemented and deployed paves the way to the most successful and cost-effective results.

Power, safety and complexity
For more than a decade, hundreds of thousands of EV chargers have serviced millions of EVs in billions of successful sessions – and where there is experienced operational planning, it happens in seamless fashion.

Behind the scenes, that steady performance is supported by proactive EV industry stakeholders

who develop, implement and continuously improve standards that define the safest means for batteries to connect with varied power architectures and grid connected equipment – in every environment and use case. The results of this work are evidenced by repeated safe charging operation, even with the most novice users.

Testing and validation
From the battery management system (BMS) to the charging system, an exponential rate of software code is executed throughout the charging process to ensure drivers, users and bystanders all remain safe. Implementations of communications software, especially as charging systems become more powerful, demand detailed attention to every safety check and quality control.

This is where interoperability testing and validation are the bedrock of the EV industry. Safety and successful connections permeate not only the standards as written, but must be proven out in labs and test tracks for every interoperable EV to connect to every interoperable charger.

Who is in charge of charging?

With standards and interoperability, the responsibility for safe and reliable charging operations is made easier for all. The vehicle and its BMS play the leading role for when and how charging takes place.

Vehicle batteries are valuable assets and vehicle makers work hard to design a sophisticated BMS that can protect drivers as well as the world in which an EV is driven. For safety and longevity, charging systems always play the supporting role of delivering the power that the vehicle requests, while maintaining safety controls in connection to the grid.

This symbiotic relationship makes it incumbent upon every vehicle manufacturer to bring major charging infrastructure technologists into their R&D process to ensure successful and reliable charging – not only for drivers, but for their customers who operate fleets and transit operations – as well as the networks and utilities that serve the entire transportation ecosystem with reliable services around the clock. By following interoperability best practices, vehicle makers, fleet operators and infrastructure owners can save time, cost and unanticipated down time long before an EV launches and infrastructure deployment projects get underway.

Interoperability insights

- Standards provide a blueprint, but they do not guarantee functional interoperability
- Interoperability testing and validation are less expensive and disruptive to users when done in a lab versus in the field
- Successful EV launches include interoperability testing early in the vehicle R&D cycle
- Successful public, transit and fleet EV procurement programs require vehicle models be pre-tested and validated with experienced charging technology providers

Interoperability checklist

- Learn and understand key aspects to safety and reliability of charging power systems
- Participate in standards organizations and industry interoperability test events
- Work with charging infrastructure technology companies early in the vehicle R&D cycle
- Build interoperability partner testing into vehicle launch timelines, allowing several weeks for collaborative safety and accuracy assurance checks throughout the validation process
- Complete interoperability testing with all major hardware infrastructure technology firms prior to every vehicle market introduction
- Require interoperability testing and validation among approved vehicle and charger vendors for passenger and fleet vehicle programs

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Fleet and transit sites highly value interoperable charging solutions for most supplier choice as well as technological redundancy.

Key insights

1 Standards provide a blueprint, but they do not guarantee functional interoperability.

2 Interoperability testing and validation are less costly and disruptive in a lab versus in the field.

3 Successful EV launches include interoperability testing early in the vehicle R&D cycle.

4 Successful public, transit and fleet EV programs require vehicles are validated for charging tech interoperability.

Interoperability checklist

- Learn and understand key aspects to safety and reliability of charging power systems

- Participate in standards organizations and industry interoperability test events

- Work with charging infrastructure technology companies early in the vehicle R&D cycle

- Build interoperability testing and validation into vehicle launch timelines

- Complete interoperability testing with infrastructure technology firms prior to vehicle market introduction

- Require interoperability testing and validation for funded EV infrastructure programs