BRIEFING

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Improving public charging infrastructure reliability

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INTRODUCTION

Battery electric vehicles and charging infrastructure work together as a system: a robust charging infrastructure ecosystem must be deployed alongside the growth of the electric vehicle fleet. Although the number of public chargers installed is usually known across the different electric vehicle (EV) markets, data on how well they function is lacking. While early EV adopters are willing to tolerate some charging event failures, a highly reliable and easy-to-use charging infrastructure is critical for building confidence as consumers shift from combustion engine vehicles to EVs. There is therefore a need to assess and improve public charging reliability to ensure this does not slow down the transition to electric vehicles.

This briefing summarizes issues concerning the reliability of publicly accessible charging infrastructure and reviews actions taken to address these problems in select jurisdictions. The paper also provides policy recommendations, many of which stem from a June 2022 workshop organized by the ZEV Alliance. The workshop aimed to facilitate deep knowledge sharing and collaborative problem-solving around the reliability of publicly accessible charging infrastructure.[1]

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1 ZEV Alliance, "Deep dive session on public charging infrastructure reliability," June 16, 2022, Private online event.

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PUBLIC CHARGING RELIABILITY: CHALLENGES AND SOLUTIONS

Many jurisdictions are developing standards and uptime requirements to increase the reliability of publicly funded or publicly accessible chargers. This section describes the failures that can occur when consumers attempt to charge an EV and the challenges encountered by jurisdictions when trying to increase charger reliability through implementing charger standards. The section also provides a framework that jurisdictions could consider when designing such standards.

WHAT CAN GO WRONG WHEN A CONSUMER TRIES TO CHARGE THEIR EV?

Several malfunctions can be encountered when attempting to charge an EV at a public charger. Understanding the different types of failures, their causes, and who is responsible for their correction is key to increasing public charging reliability. A 2022 University of California, Berkeley study found that only 77% of public chargers in the San Francisco Bay area were functional, defined as those with charging sessions that lasted at least 2 minutes.[2] The study reported six types of malfunctions encountered in the San Francisco area: broken connector, blank or non-responsive screen, error message on screen, connection error, payment system failure, and charge initiation failure. These are described in more detail below.

Monitorable charger or network failure. This error includes a blank or non-responsive screen, an error message on the screen, or a connection error. The malfunction occurs at the charger level or in the network itself and should be easily detectable. This error can be monitored remotely using standard protocols, such as the Open Charge Point Protocol (OCPP).

Internal payment system failure. This is a failure to authorize a valid payment from a user. The problem happens between the charging point and the charge point operator. This is likely to be an intermittent failure and understanding the root causes would take significant knowledge of individual proprietary systems, making it hard to monitor.

External payment system failure. For this failure, the error happens between the charger and the payment system or between the payment system and the external payment authorization system. Many different causes can create an external payment system failure, including connectivity issues, payment terminal failure, or an expired credit card; determining what triggers a specific failure and addressing it requires deep knowledge of multiple proprietary systems. It is thus very hard to monitor.

Charge initiation failure or vehicle-to-charger communication failure. This refers to the failure to start a charging event or a charging event discontinuing sooner than desired by the customer. These types of failures, typically caused by miscommunication between the charger and the EV, can only be identified and diagnosed by installing a test device that monitors and interprets communications between the two.

Unmonitored charger failure. This type of error includes a broken connector, blank or non-responsive screens of unknown cause, and a blocked charger. These failures are not

2 David Rempel, Carleen Cullen, Mary Matteson Bryan, and Gustavo Vianna Cezar, "Reliability of Open Public Electric Vehicle Direct Current Fast Chargers," (University of California, Berkeley, 2022), http://dx.doi.org/10.2139/ssrn.4077554

monitored remotely. They can only be identified through consumer reporting or physical routine maintenance and inspection, making monitoring inherently less reliable.

WHAT ARE THE MAIN REASONS FOR CHARGER UNRELIABILITY?

The California Energy Commission hosted a public workshop in October 2022 to discuss the reliability of electric vehicle chargers and ways to ensure and enhance reliability.[3] During this workshop, charging network operator Electrify America presented the top six causes of direct current (DC) fast charging unreliability, shown in Table 1.[4]

Table 1. Principal causes of DC fast charging unreliability.

Cause of DC fast charging unreliability	Explanation
Hardware reliability	This includes the failure rate of hardware components and the time it takes to replace them. The responsibility to improve this mostly falls on charge point manufacturers. This can be monitored through uptime data.
Vehicle interoperability	Standardization of vehicle plugs and charging connectors across makes and markets is inconsistent and can lead to charging failure. This can be monitored through an assessment of charge success rates.
Global supply chain disruptions	This results in industry-wide parts shortages and increased lead time to replace non-functioning parts.
Service operations	There is a need for enhanced real-time remote monitoring diagnostic capabilities and a decrease in repair time.
Network IT management systems	These systems allow charge point operators to communicate with and manage the charge points. The rapid growth of charger utilization and the customer base can put stress on the IT structure.
Payment authorization	This can be internal or external payment system failure and remains a top driver of unreliability.

WHAT TOOLS CAN BE USED TO IMPROVE RELIABILITY?

Several tools can be used to assess and improve charging infrastructure. Table 2 below presents different tools that can be used to increase reliability of public chargers and assess their pros and cons. For each tool, a description and a suggestion for government action is included. Most government actions could be implemented for publicly funded chargers as a requirement to get funding, and for chargers on public land as a requirement in the call for tenders. However, the possibility of implementing these actions for privately funded but publicly accessible chargers on private land depend on the legal frameworks of each jurisdiction.

3 California Energy Commission, "Workshop on Electric Vehicle Charging Infrastructure Reliability Standards," October 21, 2022, https://www.energy.ca.gov/event/workshop/2022-10/workshop-electric-vehicle-charging-infrastructure-reliability-standards

4 Electrify America, "Drivers of DCFC charging unreliability and how to measure", October 21, 2022, https://efiling.energy.ca.gov/GetDocument.aspx?tn=247139

Table 2. Tools that can be used to assess and improve charger reliability.

Reliability assessment tool	Description and possible government action	Pros	Cons
Remote monitoring	Data can be collected remotely through a network connection to the charger. Governments could develop standards with minimum hardware and software requirements to enable remote monitoring, and mandate public reporting from charge point operators.	Monitoring the operative status of the charger can be implemented through standard protocols. Depending on hardware and software types, many elements can be monitored.	A thorough understanding of multiple proprietary systems is needed to access information beyond the operative status of the charger, such as monitoring payment interoperability. If hardware and software requirements for remote diagnostics are too stringent, this could increase the price of chargers.
Preventive maintenance	Physical inspection, cleaning, and servicing of chargers on a specified interval. Governments could mandate physical inspection of the chargers at a certain frequency.	Maintenance can identify failures not detected through other means.	This could increase costs significantly depending on the frequency.
Recordkeeping and reporting	Specific records can contain a database of timestamped operative statuses, total attempts to charge and success rate, and corrective maintenance reactiveness. Governments could require charge point operators to report publicly on how well they are performing against the set of metrics mentioned for this database. To ease this process, governments could set up a standardized system for this public reporting.	Reporting can help to identify recurring errors and their potential cause. Reporting a high uptime/success rate can be beneficial for businesses.	A workforce needed to parse, homogenize, and analyze this data.
Field monitoring	The monitoring involves systematically testing chargers operating in public using a protocol designed to identify and categorize failures. Governments could contract companies to conduct random field tests on public chargers.	Can allow for possible identification of most failures.	No standards currently exist for comprehensive field diagnostics and categorization of failures.
Consumer surveys	A system that assigns a unique identifier to chargers and a means for consumers to report downed chargers / failed charging sessions. Governments could design this system and require charge point operators to provide a convenient way of reporting failures.	Surveys can increase monitoring coverage for little cost.	The surveys can only report a non-technical diagnosis and there is a potential for false reporting.

Note: Reliability assessment tools adapted from California Energy Commission, "Electric Vehicle Charging Infrastructure Reliability Workshop," October 21, 2022, https://efiling.energy.ca.gov/GetDocument.aspx?tn=246672

DESIGNING A RELIABILITY STANDARD

In order to ensure reasonable uptime for chargers, governments can implement a charger reliability standard. Defining what is included within a reliability standard is critical but difficult because, as described above, many different aspects can make a charger unusable. When developing a reliability standard, topics to be addressed include the types of malfunctions covered, the type and format of data to be reported, the quality of the data, the frequency of the reporting, the accessibility of these data, and the responsible parties.

The more comprehensive the definitions are, the more reliable the charger will be, with a commensurate improvement to user experience. However, jurisdictions risk increasing chargers' upfront and operating costs by mandating the inclusion of ancillary devices to record and analyze performance and requiring regular preventive maintenance. This could potentially impede the pace of charger deployment by discouraging the private sector and could lead to increased costs passed on to consumers.

Another layer of complexity is added for charging networks or infrastructure hardware manufacturers operating in different markets if these various markets do not have the same reporting and reliability standards. Finally, governments might not have the legal authority to impose reliability standards on all chargers, meaning these standards may be restricted to publicly funded chargers or chargers installed on public land.

Step-by-step approach

There are four key steps to consider when defining a reliability standard. Figure 1 presents these four steps, along with the questions to be answered and the actions to be undertaken for each step. These steps are described in more detail below.

1. Decision on the chargers targeted

Questions to be answered
- Which chargers should the reliability standard target?

Key actions
- Identify which chargers drive users' dissatisfaction
- Understand what can legally be done

2. Definition of the reliability concept

Questions to be answered
- What falls behind the reliability concept? i.e. What types of failures are considered?

Key stakeholders to work with
- CPOs, to understand what data they can come up with and the cost burden that a tight definition would imply
- Consumers to understand the most significant causes of dissatisfaction

3. Decisions on the metrics to be reported, actions to be required, and responsibilities

Questions to be answered
- What should be reported?
- What preventative actions should be taken?
- Who is responsible for reporting and acting?

Key actions
- Development of standardized metrics
- Requirements on data type and quality
- Discussions around responsibilities
- The AFIR (European Union), DoT and FHWA standards (United States), and the AFIREV (France), presented below, can provide some examples

4. Design of a framework

Question to be answered
- How should data be reported?

Key decisions
- Frequency of the reporting
- Ownership, location, quality, and accessibility of the data

Figure 1. Four key steps for defining a reliability standard

Decision on the chargers targeted. The first decision to be made is about the type of chargers targeted by the regulation. For example, jurisdictions could first target DC fast chargers receiving public funding while other jurisdictions could decide to target all publicly accessible chargers. This decision will influence the standard based on the highest factors for reliability and on what is legally possible to require.

Definition of the reliability concept. Jurisdictions should determine a clear and detailed definition of charging reliability. This step should establish what type of failures are considered when determining charger uptime. Working with the market stakeholders, such as charge point operators, is key to understanding what data can be made available and the cost burden that a tight definition would imply. Working with consumers is also key to understanding the most significant causes of charger dissatisfaction.

Decisions on the metrics to be reported, actions to be required, and responsibilities. Once the reliability concept has been defined, jurisdictions should devise a way to monitor the different charging failures. This step should determine what should be reported, what preventative actions should be taken, and who is responsible for reporting and acting. This step includes the development of standardized metrics, requirements on data type and quality, and discussions around responsibilities.

Design of a framework. Lastly, a framework should be established concerning how should data be reported. It includes a decision on the frequency of the reporting and the ownership, location, quality, and accessibility of these data.

JURISDICTIONS' ACTIONS TO ADDRESS CHARGING RELIABILITY

Jurisdictions have undertaken several actions and strategies to improve the reliability of publicly funded chargers. Select examples of these are provided below.

CALIFORNIA

The California Energy Commission (CEC) is mandated under Assembly Bill 2061 to develop uptime recordkeeping and reporting standards for electric vehicle charging stations that received public funding.[5] In response to stakeholder feedback gathered at a workshop on EV charging infrastructure reliability, the California Air Resources Board and the CEC are considering two approaches to address charging reliability failures for publicly funded chargers.[6] Charger interoperability and payment system failures would be addressed prior to charger installation through communication standards and conformance with equipment. Charger and network failures and internal payment system failures would be addressed through performance standards and monitoring. The approach for the remaining failures (intermittent payment system failures and external payment system failures) is still under development.[7]

In the near-term, multiple options are being considered by CEC for remote and physical monitoring in the reliability standards. For remote monitoring, an operative status of charge could be implemented, all elements could be monitored by Electric Vehicle Service Providers' (EVSPs) proprietary systems, and comprehensive hardware and software requirements for remote diagnostics could be developed. For physical monitoring, random field inspections can be conducted, consumers can report on the status of the chargers, and governments could require preventive maintenance.

5 AB-2061 Transportation electrification: Electric vehicle charging infrastructure, Published 09/19/2022, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB2061

6 California Energy Commission, "Electric Vehicle Charging Infrastructure Reliability Workshop," March 11, 2022. https://efiling.energy.ca.gov/getdocument.aspx?tn=242337

7 California Energy Commission, "Electric Vehicle Charging Infrastructure Reliability Reporting and Data Standards," accessed March 6, 2023, https://www.energy.ca.gov/proceedings/energy-commission-proceedings/electric-vehicle-charging-infrastructure-reliability

These options each collect different levels of detail and have varying difficulties of implementation.

California is considering requiring a 97% uptime requirement for public chargers for 5 years from the time of commissioning.[8] This requirement, which is already applied to the beneficiaries of the Rural Electric Vehicle (REV) and Relief for Energy Assistance through Community Help (REACH) programs, will be extended to chargers funded by the CEC. Different uptime requirements would apply for Level 2 and DC fast chargers, and it is the grant recipient's responsibility to demonstrate that the uptime requirement is met.[9] The definition of which types of malfunctions would be included when determining uptime has not yet been determined. One proposed option is to have the same uptime requirement for all chargers but decrease the level of record keeping, analytical requirements, and preventive maintenance required for smaller projects or projects in disadvantaged communities to make them less onerous.

CANADA

A report commissioned by natural resources Canada showed that, in January 2022, 6% of AC and 5% of DC chargers were offline while 7% and 11% of AC and DC (respectively) charging sessions failed, lasting less than 5 minutes. As a result, drivers rated their charging experience about 3.6/5.[10] To address charging reliability issues, Canada requires a mandatory Operation and Maintenance Plan to be submitted with requests for funding, including estimated service levels, plans for routine maintenance, and up-time targets.[11]

CHILE

Chile is working on a regulation to clarify the role of stakeholders. The draft regulation makes charger owners responsible for ongoing maintenance to ensure chargers are in good condition, sending uptime data to an interoperability platform in real-time, maintaining a minimum uptime, and ensuring the interoperability of electric vehicle and chargers.[12] In addition, an interoperability platform will be established to collect data from all operators and make it available to the public.

EUROPEAN UNION

The European Commission released the Alternative Fuel Infrastructure Regulation (AFIR) proposal in 2021, which would set legally binding public charging infrastructure deployment targets for all Member States.[13] To monitor the deployment of these chargers, the Commission also proposed reporting requirements. The definitions and guidelines they provide can provide helpful information when designing a reliability standard.

8 State of California, "California's Deployment Plan for the National Electric vehicle Infrastructure Program," June 2022, https://dot.ca.gov/-/media/dot-media/programs/sustainability/documents/california-nevi-deployment-plan-draft.pdf

9 California Energy Commission, "Electric Vehicle Charging Infrastructure Reliability Workshop," March 11, 2022.

10 Natural Resources Canada, **"**2022 Snapshot of Canada's Electric Charging Network and Hydrogen Refueling Stations for Light-duty Vehicles," January 2022, https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/resource-library/3489

11 Government of Canada, "Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative," 2021, https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/electric-and-alternative-fuel-infrastructure/electric-vehicle-alternative-fuels-infrastructure-deployment-initiative/18352

12 Gobierno de Chile Ministerio de Energía, "Plataforma de Electromovilidad [Electromobility Platform]," https://energia.gob.cl/electromovilidad/reglamentacion/normativa-sistemas-de-carga

13 European Commission, "Proposal for a regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council," July 14 2021, https://ec.europa.eu/info/sites/default/files/revision_of_the_directive_on_deployment_of_the_alternative_fuels_infrastructure_with_annex_0.pdf

Article 18 of the proposed AFIR rules identifies data to be provided by the operators of publicly accessible charging infrastructure, and Annex III clarifies the reporting requirements. Charge point operators are responsible for making certain data publicly accessible at no cost through the National Access Points.[14] These data include geographic location, number and type of connectors, power output, operational status, availability, and ad-hoc price. Member States are responsible for ensuring the data is accessible on an open and non-discriminatory basis to all stakeholders through a National Access Point. They are also responsible for reporting the number of recharging points and stations aligning with a specific categorization, the total aggregated power output of the recharging stations, and the number of stations not operational on 50% of days in a given year.

In the proposal, the Commission reserves the right to adopt delegated acts to add additional data types, specify data format frequency and quality, and establish detailed procedures enabling the provision and exchange of data. These delegated acts could provide additional helpful information for the development of reliability standards.

FRANCE

Under the patronage of the Ministry of Economy, Industry, and Digital, the French Association for roaming of EV charging services (AFIREV) coordinates initiatives and standards between stakeholders to promote charging interoperability and supports the French vision regarding European initiatives and regulatory bodies. AFIREV created a "quality chart" that charging point operators, mobility service providers which give drivers access to a charging network, and roaming platforms which allow drivers to access to chargers outside their service providers' network can sign committing to certain performance requirements.[15] The quality indicators include the number of successful charging sessions, the number of charging points available, the rate of charging points unavailable for more than seven days, and the rate of assistance requests. In 2020, AFIREV launched a "Quality of service observatory" to monitor and improve chargers' reliability. AFIREV constantly monitors data and reports national and regional data on the above quality indicators twice a year.[16]

As of July 2022, the French Government requires charging point operators, mobility service providers, and interoperability platforms to publicly report annually on certain charger reliability metrics.[17] Charging point operators are required to report on uptime and share of successful sessions. Mobility service providers and interoperability platforms are required to report the functioning time of the informatic system and compliance with a maximum time it should take to authorize a session. Charging stations must also be checked physically at least once a year to prevent charging failures.

14 National Access point is a digital interface, implemented by Member States, where certain data are made accessible for re-use to data users. European Commission, National Access Points, https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems/road/action-plan-and-directive/national-access-points_en

15 Association Française pour l'Itinérance de la Recharge Électrique des Véhicules, "Quality of Service FAQ & Definitions," accessed February 3, 2023, https://afirev.fr/en/quality-of-services/

16 Association Française pour l'Itinérance de la Recharge Électrique des Véhicules, "Observatoire de la qualité des services de recharge électrique accessibles au public Edition S1 2022 [Observatory of the Quality of Electric Charging Services Accessible to the Public]," (2022), https://www.observatoire-recharge-afirev.fr/edition-s1-2022/

17 République Française, Arrêté du 27 octobre 2021 relatif aux engagements de qualité de service relatifs aux infrastructures de recharge pour véhicules électriques ouvertes au public, https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000044287282

NETHERLANDS

The Netherlands aims for a charger uptime requirement of 99% and a maximum of three failures per month for publicly accessible charging infrastructure.[18] This has been decided in collaboration with CPOs. However, the extent to which this 99% can be attained depends on how uptime is defined, which is still in discussion. One of the most significant issues regarding public charger reliability is blocked access to the charger, which is hard to monitor and quantify and, thus, is difficult to include in the "reliability" standard and uptime requirement.

The Netherlands Knowledge Platform (NKL) developed, in cooperation with municipal governments and the private sector, a set of Guidelines and a Uniform Standard for Charging Plazas.[19] The standard provides an overview of the requirements and options that may be considered in making agreements in relation to a charging plaza and includes information on management and monitoring, including repair service, cleaning, maintenance, and uptime. The guidelines states that a periodic (preferably monthly) management report should be delivered to municipal governments that includes, uptime, the duration and type of malfunctions, the number of malfunctions above the set standard, recurring malfunctions, and a plan to reduce the number of malfunctions. In its Guidelines, NKL suggests including desired uptime percentage in procurement documents.

NEW ZEALAND

In 2018, New Zealand developed the EVRoam platform, a live, publicly accessible database and central government repository of charger locations and availability.[20] This is a collaborative process; the database relies on charging point operators reporting and submitting their data. Only chargers complying with specific requirements can be included the EVRoam database so that when drivers arrive at a charger, they can be assured that the charger is working and will fit their vehicle. Similarly, to benefit from government funding, operators must comply with requirements such as an annual availability of 95%.[21]

UNITED KINGDOM

The Office for Zero Emission Vehicles (OZEV) within the Department for Transport conducted a consultation in 2022 on improving consumer experience at charge points open to the public, including payment, reliability, pricing transparency, and data sharing. Regulations resulting from this consultation are due to be published in 2023.[22] One year after the legislation comes into effect, all operators of publicly accessible charge points will have to publish specific data and adopt the Open Charge

18 The Netherlands Knowledge Platform for public charging infrastructure, "Uniform standards for public charging stations from policy to realization", December 2021, https://nklnederland.nl/wp-content/uploads/2021/12/NKL-Engels-2018-def-charging-stations.pdf

19 NKL, "Guidelines for the realization of charging plazas," 2019, https://nklnederland.nl/wp-content/uploads/2021/12/Guidelines-for-the-realization-of-charging-plazas.pdf; NKL, "Standard Set Charging Plazas," 2019, https://nklnederland.nl/wp-content/uploads/2021/12/Standard-Set-Charging-Plazas.pdf

20 New Zealand Transport Agency, "EVRoam," accessed February 3, 2023, https://www.nzta.govt.nz/planning-and-investment/planning/transport-planning/planning-for-electric-vehicles/evroam

21 Energy Efficiency and Conservation Authority, "Round 2: Adoption of Public Charging Infrastructure," accessed February 3, 2023, https://www.eeca.govt.nz/co-funding/transport-emission-reduction/low-emission-transport-fund/round-2-adoption-of-public-charging-infrastructure/

22 Department for Transport, Office for Zero Emission Vehicles, "The consumer experience at public charge points," 2022, https://www.gov.uk/government/consultations/the-consumer-experience-at-public-electric-vehicle-chargepoints/the-consumer-experience-at-public-chargepoints

Point Interface (OCPI) data standard, the rapid (fast) network will have to comply with 99% reliability, and a 24/7 consumer helpline must be available. Two years after the introduction of the legislation, the possibility of extending the 99% reliability metric to the entire public charging network will be considered.

The UK government has the authority to implement such reliability standards due to the Automated and Electric Vehicles Act 2018 (AEVA) and the Pricing Act 1974.[23] These two acts enable them to require a common payment method at all public charge points and introduce a common pricing metric for the supply and sale of electricity to consumers. The Act also allows the government to introduce reporting requirements for charge point operators, in addition to performance and interoperability standards for charge points.

UNITED STATES

In February 2023, the U.S. Department of Transportation and the Federal Highway Administration released national standards for federally funded chargers.[24] Similar to the AFIR, this rulemaking can provide helpful information for jurisdictions designing a reliability standard.

The requirements include a minimum average annual uptime of 97%, defined as "when its hardware and software are both online and available for use, or in use, and the charging port successfully dispenses electricity in accordance with requirements for minimum power level." In addition to the uptime percentage requirement, an equation is provided to ensure data consistency. This data must be reported on monthly basis for the previous twelve months. Reporting of additional data related to chargers, such as location, pricing, and ports, is also standardized. It falls on states or recipients of the funding to make sure that selected data requests are made available, free of charge, to third party software developers.

CONCLUSION

Based on the points highlighted in the previous sections and discussions that took place in June 2022 between various ZEV Alliance jurisdictions, we draw the following conclusions on increasing public charging reliability.

Regulators could consolidate efforts to better categorize and address the types of failures that can occur during charging. Regulators can address the different issues that affect charging reliability using various approaches. Some malfunctions, such as charger blockage or broken connectors, can be addressed through consumer education. Before the installation of the equipment, third-party performance tests could be mandated to address EV-charger interoperability and payment system failure issues. After the installation of the equipment, charger and network failures

23 Department for Transport, Office for Zero Emission Vehicles, "The consumer experience at public charge points."

24 Federal Register, Rule by the Federal Highway Administration on 02/28/2023, National Electric Vehicle Infrastructure Standards and Requirements, https://www.federalregister.gov/documents/2023/02/28/2023-03500/national-electric-vehicle-infrastructure-standards-and-requirements; The White House, "Fact Sheet: Biden-Harris Administration Announces New Standards and Major Progress for a Made-in-America National Network of Electric Vehicle Chargers," February 15, 2023, https://www.whitehouse.gov/briefing-room/statements-releases/2023/02/15/fact-sheet-biden-harris-administration-announces-new-standards-and-major-progress-for-a-made-in-america-national-network-of-electric-vehicle-chargers/

and internal payment system failures can be addressed through the enforcement of performance standards and reporting requirements.

Four key steps should be considered when defining a reliability standard. First, jurisdictions should decide which chargers are targeted by the reliability standard. Second, the reliability concept should be clearly defined, and jurisdictions should work with consumers and businesses to determine a clear and detailed definition of "public charging reliability." Third, once the reliability concept has been defined, jurisdictions must devise a way to monitor these different failures. Regulators should decide on the metrics to be reported, actions required, and responsibilities. Last, a framework should be established concerning how should data be reported, including the frequency of the reporting and the ownership, location, quality, and accessibility of these data.

Jurisdictions can benefit from knowledge sharing and alignment on reliability standards. Several jurisdictions have begun developing charging reliability standards. In an upcoming regulations, charger operators in the United Kingdom and the Netherlands will have to comply with a 99% uptime requirement, while the United States is implementing a 97% uptime requirement for publicly funded chargers. In New Zealand, publicly funded chargers must comply with a minimum 95% uptime requirement. For the EU, some organizations are suggesting a 98% or 99% uptime requirement under the AFIR for all publicly accessible chargers.[25] CPOs publishing aggregated data on a public platform on the frequency of different types of failures could also help improve the overall charging network reliability. To make it easier for charging point operators and charging hardware companies to meet uptime and reporting requirements, jurisdictions are encouraged to align on the reliability definition, metrics, and reporting protocols.

25 Fabian Sperka, "AFIR - Cars and Vans: The EU makes charging anxiety a thing of the past," (Transport and Environment, 2021), https://www.transportenvironment.org/wp-content/uploads/2021/09/TE-AFIR-LDV-reaction.pdf