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Tesla Comments CEC Draft Reliability Field Testing Protocol

Additional submitted attachment is included below.

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December 11, 2023

Docket No: 22-EVI-04
California Energy Commission
715 P Street
Sacramento, CA 95814

RE: Comments on Draft EV Charger Field Testing Protocol

Energy Commission Staff,

Tesla appreciates the opportunity to provide feedback in response to the California Energy Commission's (CEC) draft *EV Charger Field Testing Protocol.* We commend the consistent efforts by CEC staff over the last two years to gather data to better assess the quality and quantity of California's electric vehicle (EV) charging infrastructure. Tesla has been an active participant in the CEC's reliability workshops and previously submitted comments in this docket.

Tesla provides the below comments in response to the proposed EV charger Field Testing Protocol[1].

1) The necessity of charging location and charging site should be evaluated.

It is unclear if both "charging location" and "charging site" are necessary study terms to differentiate. There are locations with multiple charging stations at a general location, such as in a mall parking facility. However, most often each charging station is located at different address and has separate geographic coordinates which help differentiate the stations. Additionally, the location of a charging site is already a defined term in other state and federal reporting requirements. As such, there could be some confusion when comparing to other reports or when publishing findings. As outlined in the Appendix, we recommend limiting the study to charging site.

2) Connectors should be formally named, instead of simply Level 1, Level 2, or DCFC.

Connectors should be specified by their formal or SAE name, instead of simply the level of charging. Appendix 1 includes recommended connector names to capture. Additionally, the survey should capture the number of Level 1, Level 2, and DCFC connectors at a charging site to capture sites that offer both Level 2 and DCFC.

3) The differences between available and operable should be better defined.

Questions 4.2.11-16 request evaluation of if ports are available and separately if they are operable. It would be helpful to clarify the definitions of each. Does available refer to the port not being in use, and thus available to be used? For example, could the same port be available at 4:00 AM but not available at 4:00 PM? If so, we recommend capturing when the tester is completing the test, both date and time, to be able to remove outliers and capture indirect trends. Similarly, does operable mean in active use or does it mean adequately functioning? Clarifying these terms will be important for accuracy in testing and reporting.

4) Accessibility evaluation should be on explicit requirements not subjective impressions.

[1] Erinne Boyd Comments – November 20, 2023. Available in docket no. 22-EVI-04.

Questions 3.2.4 asks if the station is ADA-compliant. As the testers are unlikely to be accessibility specialists or code officials, it would be challenging to adequately answer if a station is or is not ADA-compliant or accessible per California accessibility code requirements for EV charging stations. California established specific accessibility code requirements in 2017 and has added further requirements in following code cycles applicable to new stations. We recommend the questions be regarding the provision of specific accessibility features, such as an accessible parking stall or an access aisle.

5) **Perception of safety or operability aren't reliable metrics for objective conclusions.**

The perception of charging station safety may be subjective based on a number of factors including time of day, time of year, day, tester age, tester gender, and station usage, among others. As such it would be challenging to keep bias from skewing the numbers and comparative numbers to other stations. We recommend instead using static, objective questions such as the availability of lighting, safety call numbers, distance from other uses, etc. Similarly, Question 4.2.15 asks "does port of charger X seem operable", which is asking for the subjective perception of if a charging station is operable based on the tester. A better question might be if the station is capable of delivering a charge.

6) **Information display locations should be comprehensive of variation between chargers.**

Information about station location, availability, cost, payment methods, charging status, and other information may be provided in several different locations, depending on the vehicle or the EV charging station. For example, one charging station may provide information about pricing in the vehicle UI or mobile in an application only, whereas another may only provide pricing information on a charger's display screen. The testers should comprehensively review information display locations for relevant questions to ensure it is accurately capturing how and where data is provided.

7) **The charge interruption protocol should be further clarified.**

More information should be provided on the approach and intent of the charge interruption protocol. Is it an intentional charge interruption? Is the intent to test the amount of kWhs provided? The kWh provided may vary depending on the battery's state of charge, temperature, power sharing, and other factors.

***

Tesla appreciates the opportunity to provide feedback on the CEC's EV Charger Field Testing Protocol. We sincerely applaud the CEC's initiative to improve charging infrastructure and drive EV adoption in California. We look forward to engaging on the implementation of this regulation going forward.

Sincerely,

Noelani Derrickson
Senior Advisor
Business Development and Public Policy
Tesla, Inc.

APPENDIX

GLOSSARY OF TERMS

~~Charging Location:~~

~~An Electric Vehicle (EV) charging location refers to a general area or facility where electric vehicles can be charged. This could encompass a variety of settings such as parking lots, garages, or designated spaces within a city. For this study, every row within the Alternative Fuels Data Center's public charger dataset represents a unique charging location.~~

Charging Site:

An EV charging site refers to a specific location ~~within the general charging location area~~ that houses a ~~set of~~ charging station~~s~~.

Charging Station:

An EV charging station is a facility designed to charge electric vehicles. It typically includes one or more charging ports, a power supply system, and control equipment. Charging stations can vary in terms of charging speed (Level 1, Level 2, or DC fast charging).

Charging Port:

An EV charging port supplies power for charging one vehicle at a time, even if it has multiple connectors. The device containing these EV charging ports can be called a charging station, which may feature one or more charging ports.

1 Virtual (From Assigned EVSP App)

Do not open this document until navigational instructions to test charging location have been received. Open the assigned navigation app and input the assigned charging station as the destination. If information is available, provide a summary of the information you can find remotely of the assigned charging station of interest, including accessibility and availability of chargers

1. According to {EVSE App}, what are the GPS coordinates of the charging location?
□ GPS coordinates-only Entry Box

2. According to {EVSE App}, how many chargers are at {charging location}?
□ Integer-only Entry Box -> num_chargers
For each {charger} at {charging location} (repeat questions 3-11 min(num_chargers, 20) times):

3. According to {EVSE App}, what is the power rating of {charger}?
□ Integer-only Entry Box

4. According to {EVSE App}, what connectors does {charger} have?
□ Level 1: SAE J1772, NACS (SAE J3400)
□ Level 2: SAE J1772, NACS (SAE J3400)
□ DC Fast: CCS, CHAdeMO, NACS (SAE J3400)
~~□ DC Fast: CHAdeMO~~
~~□ Tesla/NACS~~
□ Other (please specify): _____
□ {EVSE App} doesn't report this information

5. According to {EVSE App}, how many ports does {charger} have?
o 1 -> num_ports

o 2 -> num_ports
o 3 -> num_ports
o 4 -> num_ports
o 5 -> num_ports
o 6 -> num_ports
o Other (please specify): _____ -> num_ports
o {EVSE App} doesn't report this information
[if "{EVSE App} doesn't report port-level information," skip questions 6-11]

6. What is the power sharing mechanism of {charger}'s ports?
o Not shared, only one works at a time
o Shared
o Not applicable
o {EVSE App} doesn't report this information
For each {port} of {charger} (repeat questions 7-11 min(num_ports, 6) times):

7. Is there information on {EVSE App} about the availability of {port} of {charger}?
o Yes
o No
[if "Yes," then proceed
If "No," then skip question 8]

8. Is {port} of {charger} available at {charging location}?
□ Yes
□ No

9. Is there information on {EVSE App} about the operationality of {port} of {charger}?
o Yes
o No
[if "Yes," then proceed
If "No," then skip question 10]

10. Is {port} of {charger} operational at {charging location}?
o Yes
o No

11. Which of the following connectors does {port} of {charger} have? [Include Pictures of each type]
o Level 1: SAE J1772, NACS (SAE J3400)
o Level 2: SAE J1772, NACS (SAE J3400)
o DC Fast: CCS, CHAdeMO, NACS (SAE J3400))
~~o DC Fast: CHAdeMO~~
~~o Tesla/NACS~~
o Other (please specify): _____
o {EVSE App} doesn't report this information

2 En Route (Using Assigned GPS Navigation App)
Open assigned navigation app and record the location specific information of the charging station communicated by the navigation app such as GPS coordinates, directions for getting to the charging station such as distance and time to destination. Note any traffic congestion en route.

2.1 Before departure:

1. According to {Navigation App}, what are the GPS coordinates of {charging location} site?
 GPS coordinates-only Entry Box

2. According to {Navigation App}, how far away is {charging location} site from {starting location}?
[Post-process using google maps API, remove question]
 Integer-only Entry Box (miles)

3. According to {Navigation App}, how much time will it take to get to {charging location} site from {starting location}?
 Integer-only Entry Box (minutes)

2.2 After Arrival:

Drive to the charging station ~~and dedicated parking lot~~. Look for the first available charger nearest to approach if there are multiple ~~slots~~stalls. Document your experience. Describe your experience ~~location~~ locating and
driving to the charging station. Tell us if the charging station is in the same location as suggested by the navigation app or somewhat different. Describe your overall experience in locating the charging station within the site. Was the signage helpful?

4. How easy was it to drive to the {charging ~~location~~station} ~~site~~once arriving to site?
    - o Very Difficult: Encountered multiple issues such as complex routes or inadequate signage, causing significant delays or confusion.
    - o Somewhat Difficult: Faced some challenges like unclear directions or congestions, leading to minor delays or confusion. Faced some challenges like unclear directions, leading to minor delays or confusion.
    - o Neutral: The journey was neither particularly easy nor difficult; navigational aspects were average, and there were no exceptional issues.
    - o Somewhat Easy: Reached the location with relative ease; directions were mostly clear, and signage was adequate.
    - o Very Easy: Effortless journey with clear routes and excellent signage, resulting in no delays or confusion.

5. What are the actual GPS coordinates of {charging location} site?
 GPS coordinates-only Entry Box

6. How much time did it actually take to get to {charging location} site from {starting location}?
 Integer-only Entry Box (minutes)

7. What is the driving distance from the {charging location} site entrance to the actual chargers?
 Integer-only Entry Box (miles)

8. How easy was it to locate the chargers at the {charging location} site?
o Very Difficult Chargers were not only obscured or poorly positioned but also widely dispersed across the site. Finding all available chargers necessitated extensive time and effort, with inadequate or misleading signage exacerbating the issue.
o Somewhat Difficult Chargers were somewhat dispersed or not immediately visible, requiring active search. Signage was present but not sufficiently clear, leading to moderate delays in locating all chargers.

o Neutral Chargers were neither easy nor difficult to find; they may be somewhat spread out but were generally findable with standard effort.
o Somewhat Easy Chargers were fairly easy to locate, with some being dispersed but adequately signed to guide the user efficiently.
o Very Easy Chargers were prominently displayed and closely positioned, with clear and abundant signage, allowing for immediate and effortless location of all units.

9. What level of signage to locate chargers was present at the {charging location} site?
o Very Poor: Absence of any signage or indicators, making it highly challenging to identify the location of chargers.
o Poor: Minimal signage present, but not sufficient for clear direction. Signage may be small, outdated, or ambiguous, necessitating additional effort to locate chargers
o Adequate: Basic signage is available that allows for locating chargers with a reasonable level of effort. Signage is functional but not particularly conspicuous.
o Good: Clear and visible signage that efficiently guides the user to the chargers. Signage may also indicate the types of chargers and their availability.
o Excellent: Comprehensive, well-designed signage that is prominently displayed. Directions to all available chargers are clear, with additional information such as charger type, rates, occupancy status, and other amenities.

3 At Charging Location

- Does the charging site have an accessible stall per California requirements?
- ~~Describe your observations if you think the charging station site design has equitable access for drivers~~
- ~~with disabilities. What special features are included to be ADA compliant?~~
- Do you think there is enough redundancy of chargers in the location?
- Record how drivers are using the chargers.

3.2 Charger Info:

1. How many chargers are at {charging location}?
 Integer-only Entry Box -> num_chargers

2. Are the chargers at the {charging location} all physically accessible (like can you get to the charger and touch it)?
o No
o Yes
[if “Yes,” then skip question 3
If “No” then answer 3 and skip all questions except those in section 3.4]

3. Why are the chargers at the {charging location} not physically accessible?
o Intentionally Blocked (maintenance, holiday, etc.) [Text Elaboration] [Upload Picture]
o Unintentionally Blocked (snow, spiders, debris, etc.) [Text Elaboration] [Upload Picture]
For each {charger} at {charging location} (repeat questions 4-11 min(num_chargers, 20) times):

4. ~~Is the~~Does the {charger} ~~ADA compliant~~have a stall meeting accessible stall requirements?
o Yes [Upload Multiple Picture]
o No [Upload Multiple Picture]
o Not Sure (please specify why): _____ [Upload Multiple Picture]

5. How many ports does {charger} have?

o 1 -> num_ports
o 2 -> num_ports
o 3 -> num_ports
o 4 -> num_ports
o 5 -> num_ports
o 6 -> num_ports
o Other (please specify): _____---> num_ports

6. What is the power sharing mechanism of {charger}'s ports?
o Only one port present
o Not shared, only one works at a time
o Shared with even powersplit
o Shared with uneven powersplit
o Other (please specify): _____
o Not sure (please specify why): _____
For each {port} of {charger} (repeat questions 7-12 min(num_ports, 6) times):

7. Is {port} of {charger} physically available/open at {charging location}?
o Yes
o No
[if "Yes," then skip question 8]

8. Why is {port} of {charger} not physically available at {charging location}?
o Being used by EV
o Blocked by ICEV
o Blocked by EV
o Other (please specify): _____

9. How many parking stops can access {port} of {charger} at {charging location}?
o Integer-only Entry Box -> num_spots
For each {parking spot} that can access {port} (repeat question 10 num_spots times):

10. What is in the {parking spot}?
o Empty
o EV parked
o ICEV parked
o Other (please specify): _____

11. ~~Does~~ Is {port} of {charger} ~~seem~~ operable at {charging location}?
o Yes
o No
[if "Yes," then skip question 12]

12. If not, w~~W~~hy is ~~does~~{port} of {charger} ~~seem~~ inoperable at {charging location}?
□ Marked as out of service [Upload Pictures]
□ Offline/Unresponsive screen [Upload Pictures]
□ Error on screen or LED [Upload Pictures]
□ No power [Upload Pictures]
□ Damaged cable [Upload Pictures]
□ Damaged connector [Upload Pictures]

□ Other (please specify): _____ [Upload Pictures]
□ Not sure (please specify why): _____ [Upload Pictures]

13. Which of the following connectors does {port} of {charger} have? [Include Pictures of each type]
o Level 1 SAE J1772, NACS (SAE J3400)
o Level 2: SAE J1772, NACS (SAE J3400)
o DC Fast: CCS,
~~o DC Fast~~: CHAdeMO, NACS (SAE J3400)
~~o Tesla/NACS~~
o Other (please specify): _____

3.3 Location Info:

14. How would you rate the safety and security features present at the {charging location} site?
o Very Poor: No visible security measures or safety features, raising concerns about safety during charging.
o Poor: Minimal safety features like basic fencing, but no surveillance or security personnel present, causing some apprehension about the location.
o Adequate: Some noticeable security measures such as fencing or emergency call buttons, offering a moderate sense of safety.
o Good: Multiple safety features present like CCTV cameras and emergency buttons; however, no visible security personnel. Generally felt secure during charging.
o Excellent: Comprehensive safety and security measures including CCTV cameras, security personnel or guards, fenced perimeter, and emergency call buttons, ensuring a high level of comfort and safety while charging.

15. How safe did you feel while charging at the {charging location} site?
o Very Unsafe: Felt threatened or very apprehensive due to lack of safety measures, or suspicious activities in the vicinity.
o Somewhat Unsafe: Felt mildly apprehensive due to some concerns about the surroundings or lack of visible safety features.
o Neutral: Neither felt particularly safe nor unsafe; no specific concerns or feelings of security.
o Somewhat Safe: Generally felt at ease while charging but noticed some room for improvement in safety measures.
o Very Safe: Felt completely secure and at ease, confident in the safety measures and surroundings of the charging location.

16. What level of lighting to locate chargers was present at the {charging location} site?
o Very Poor: No visible lighting fixtures near the chargers; difficult to anticipate how the area would be illuminated during low-light conditions.
o Poor: Some lighting fixtures present, but appear inadequate or poorly placed for facilitating charger location during nighttime, or need to rely on lights on chargers to navigate
o Adequate: Basic lighting fixtures are visible and appear functional, although not tested in low-light conditions. Expected to provide a reasonable level of visibility.
o Good: Multiple well-placed lighting fixtures are visible, suggesting that locating chargers during lowlight conditions would be straightforward.
o Excellent: Abundant, well-designed lighting fixtures that are not only visible but also strategically placed to facilitate easy charger location at all times.
3.4 Nearby Charger Location Info:

17. Is there another charging location in safe walking distance (less than 0.25 miles; on the same side of the highway if applicable) of the {charging location}?
o No
o Yes
[If “No,” skip question 18]

18. How many other charging locations are in safe walking distance (less than 0.25 miles; on the same side of the highway if applicable) of the {charging location}?
 Integer-only Entry Box
[For each {Charging Location} identified in question 17, repeat Section 3]
Once you are at charging station, describe the parking situation and options available for you.

4 At Test Chargers (For Charger X | X = 1:(1 | 2 | 3 | 4) with Vehicle Y and assigned payment method Z)

4.1 Parking:

1. What is the orientation of the parking spot associated with {Charger X}?
o Standard
o Diagonal
o Parallel
[if “Standard” or “Diagonal” then skip question 3
If “Parallel” then skip question 2]

2. How did you enter the parking spot to reach the charging cable of {Charger X}?
o Front-in
o Back-in

3. What direction was the car facing to reach the charging cable of {Charger X}?
o Driver-side facing curb
o Passenger-side facing curb

4. Was it necessary to park out-of-bounds or unconventionally of the charging spot to reach the charging cable of {Charger X}?
o Yes [Upload Picture]
o No

4.2 Charger Specifications:
Describe the charger (i.e., make, model, ID) and describe the connectors available to you (i.e., CCS, CHAdeMO, NACS). What other real-time charging information that is made available to you as the driver/ user.

5. Is any metadata or service tag about {Charger X} visible on the frame of or around {Charger X}?
o Yes [Upload Picture]
o No
[if “No,” then skip questions 6-8]

6. What is the make of {Charger X}?
 Text Entry Box or Drop Down

7. What is the model of {Charger X}?
 Text Entry Box or Drop Down

8. What is the ID of {Charger X}?
 Text Entry Box or Drop Down

9. How many ports does {Charger X} have?
o 1 -> num_ports
o 2 -> num_ports
o 3 -> num_ports
o 4 -> num_ports
o 5 -> num_ports
o 6 -> num_ports
o Other: ___ -> num_ports

10. What is the power sharing mechanism of {Charger X}'s ports?
o Only one port present
o Not shared, only one works at a time
o Shared with even powersplit
o Shared with uneven powersplit
o Other (please specify): _____
o Not sure (please specify why): _____
For each {port} of {charger} (repeat questions 11-17 min(num_ports, 6) times):

11. Is {port} of {Charger X} physically available/open at {charging location}?
o Yes
o No
[if "Yes," then skip question 12]

12. Why is {port} of {Charger X} not physically available at {charging location}?
o Being used by EV
o Blocked by ICEV
o Blocked by EV
o Other (please specify): _____

13. How many parking spots can access {port} of {Charger X} at {charging location}?
o Integer-only Entry Box -> num_spots
For each {parking spot} that can access {port} (repeat question 14 num_spots times):

14. What is in the {parking spot}?
o Empty
o EV parked
o ICEV parked
o Other (please specify): _____

15. ~~Does~~ Is {port} of {Charger X} ~~seem~~ operable at {charging location}?
o Yes
o No
[if "Yes," then skip question 16]

16. If not, w~~W~~hy ~~does~~is{port} of {charger} ~~seem~~ inoperable at {charging location}?
□ Marked as out of service [Upload Pictures]
□ Offline/Unresponsive screen [Upload Pictures]
□ Error on screen or LED [Upload Pictures]
□ No power [Upload Pictures]
□ Damaged cable [Upload Pictures]
□ Damaged connector [Upload Pictures]
· Other (please specify): _____ [Upload Pictures]

17. Which of the following connectors does {port} of {charger} have? [Include Pictures of each type]
o Level 1: SAE J1772, NACS (SAE J3400)
o Level 2: SAE J1772, NACS (SAE J3400)
o DC Fast: CCS, CHAdeMO, NACS (SAE J3400)
~~o DC Fast: CHAdeMO~~
~~o Tesla/NACS~~
o Other (please specify): _____ [Upload Pictures]

4.3 Physical Condition:

4.3.1 Screen...
Before you detach the charging cable, describe other functions of the charger.

18. Is there a screen on {Charger X}?
o Yes, full display screen
o Yes, ~~/~~touch screen
o Yes, digital LCD
o No, LEDs present
o No
[if “No” or “No, LEDs present” then skip questions 19-20]

19. What is the status of the screen of {Charger X}?
o Online
o Offline
o Out of Order
o Error Message Displayed [Describe Error]
o Other (please specify): _____

20. Is the screen of {Charger X} damaged?
o Damaged but possibly functional [Upload Picture]
o Damaged beyond function [Upload Picture]
o Not damaged
o Not sure (please specify): _____ [Upload Picture]
[if “Damaged beyond function” then skip Operating Condition Section 4.4]

4.3.2 Charging Cable...
Select an available port, {Port X} of charger {Charger X} to test. Inspect the charging cable; describe your charging experience.

21. Describe ~~how~~ the management of the charging cable of {Port X} ~~was previously handled~~?
o Neatly folded and docked on the charger

o Wrapped around the charger but not docked
o Thrown on the ground
o Tangled with other cables
o Other (please specify): _____

22. Is the charging cable of {Port X} physically damaged?
o Damaged but possibly functional [Upload Picture]
o Damaged beyond function [Upload Picture]
o Not damaged
o Not sure (please specify why): _____ [Upload Picture]
[if “Damaged beyond function” then skip Operating Condition Section 4.4]

23. What is the length of the charging cable of {Port X} (in Feet)?
□ Float-only Entry Box

24. Does the charging cable of {Port X} reach the charging socket on {Vehicle Y}?
o Yes
o No
o Not sure (please specify why): _____
[if “Yes” then skip question 25,
If “No” then skip Operating Condition Section 4.4]

25. Approximately how long should the charging cable of {Port X} be to reach the charging socket on {Vehicle Y} (in Feet)?
□ Integer-only Entry Box

4.3.3 Cable Connector...
Describe the condition of the connector.

26. Which of the following connectors does {Port X} of {Charger X} have? [Include Pictures of each type]
o Level 1: SAE J1772, NACS (SAE J3400)
o Level 2: SAE J1772, NACS (SAE J3400)
o DC Fast: CCS, CHAdeMO, NACS (SAE J3400)
~~o DC Fast: CHAdeMO~~
~~o Tesla/NACS~~
o Other (please specify): _____ [Upload Picture]

27. Is the charging cable connector Iof {Port X} damaged?
o Damaged but possibly functional [Upload Picture]
o Damaged beyond function [Upload Picture]
o Not damaged
o Not sure (please specify why): _____
o [Upload Picture]
[if “Damaged beyond function” then skip Operating Condition Section 4.4]

4.4 Operating Condition:
Attempt to connect the ~~charging~~ connector to vehicle and initiate payment using supported payment method. Describe your experience initiating the charger.

28. What is the state of charge (SOC) of {Vehicle Y} before charge initiation?
□ Integer-only Entry Box (0-100)

29. Which of the following methods are available to initiate a charge at {Charger X}?
□ ~~Credit~~ Payment card: Swipe
□ ~~Credit~~ Payment card: Ch~~D~~ip
□ ~~Credit~~ Payment card: tap
□ Physical membership card
□ Mobile membership card
□ Mobile app
□ Screen interface
□ QR code on site
□ Phone call
□ SMS Text
□ Plug and charge
□ Other (please specify): _____

30. If applicable, w~~W~~hich of the following payment methods failed to initiate a charge after at most 5 attempts at {Charger X}?
□ Credit card: Swipe [record any error message]
□ Credit card: Dip [record any error message]
□ Credit card: tap [record any error message]
□ Physical membership card [record any error message]
□ Mobile membership card [record any error message]
□ Mobile app [record any error message]
□ Screen interface [record any error message]
□ QR code on site [record any error message]
□ Phone call [record any error message]
□ Text [record any error message]
□ Plug and charge [record any error message]
□ Other (please specify): _____ [record any error message]

31. If applicable, w~~W~~hich of the following payment methods successfully initiated a charge after at most 5 attempts with
{Charger X}? How many attempts did it take to successfully initiate a charge?
□ Credit card: Swipe
o Attempts: _____
□ Credit card: Dip;
o Attempts: _____
□ Credit card: tap
o Attempts: _____
□ Physical membership card
o Attempts: _____
□ Mobile membership card
o Attempts: _____
□ Mobile app
o Attempts: _____
□ Screen interface
o Attempts: _____
□ QR code on site

o Attempts: _____
□ Phone call
o Attempts: _____
□ Text
o Attempts: _____
□ Plug and charge
o Attempts: _____
□ Other (please specify): _____
o Attempts: _____
□ All methods fail
[if “All methods fail” then skip all remaining questions in Section 4.4]
If using an app for charging, take a screenshot to show that charging has initiated, and if energy is being delivered into vehicle.

32. Does the vehicle dashboard or application indicate that energy is initially being dispensed into {Vehicle Y} from
{Charger X}?
o No
o Yes
o Not Sure (please specify why): _____
[if “Yes” then skip question 33]

33. Did the vehicle dashboard display any error messages ~~given it suggests~~that energy isn’t being dispensed into {Vehicle Y} from {Charger X}?
o No
o Yes [Record any error messages]

34. Does the charger screen or LED indicate that energy is initially being dispensed into {Vehicle Y} from {Charger X}?
o No
o Yes
o Not applicable
o Not Sure (please specify why): _____
[if “Yes” then skip question 35]

35. Did the charger screen or LED display any error messages given it suggests energy isn’t being dispensed into {Vehicle Y} from {Charger X}?
o No
o Yes [Record any error messages]
o Not applicable

36. Does the {~~EVSE~~ App} indicate that energy is initially being dispensed into {Vehicle Y} from {Charger X}?
o No
o Yes
o Not Sure (please specify why): _____
[if “Yes” then skip question 37]

37. Did the {~~EVSE~~ App} display any error messages given it suggests energy isn’t being dispensed into {Vehicle Y} from {Charger X}?

o No
o Yes [Record any error messages]

38. Does the vehicle port indicate that energy is initially being dispensed into {Vehicle Y} from {Charger X}?
o No
o Yes
o Not Sure (please specify why): _____
[if “Yes” then skip question 39]

39. Did the vehicle port display any error messages (light indication) given it suggests energy isn’t being dispensed into {Vehicle Y} from {Charger X}?
o No
o Yes [Record any error messages]
[if “No” was selected for questions 23, 25, 27, and 29, skip all other questions in this section]

40. Before 10 minutes of charging at {Charger X}, did energy stop being dispensed into {Vehicle Y} from {Charger X}?
o No
o Yes
o Not Sure (please specify why): _____
[If "Yes” was not chosen, skip questions 41-44]

41. Before the charge interruption at {Charger X}, how much energy (in kWh) was dispensed into {Vehicle Y} from {Charger X}?
□ Float-only Entry Box

42. After the charge interruption at {Charger X}, what is the state of charge of {Vehicle Y}?
□ Float-only Entry Box (0-100)

43. Before the charge interruption at {Charger X}, how long (in minutes) was energy being dispensed into {Vehicle Y} from {Charger X}?
□ Float-only Entry Box

44. After the charge interruption at {Charger X}, did the screen display any error messages?
o No
o Yes [Record any error messages]

45. After 10 minutes of charging at {Charger X}, how much energy (in kWh) was dispensed into {Vehicle Y} from {Charger X}?
□ Float-only Entry Box

46. After 10 minutes of charging at {Charger X}, what is the state of charge of {Vehicle Y}?
□ Integer-only Entry Box (0-100)

47. After 10 minutes of charging at {Charger X}, did the screen or LED interface display any error messages?
o No
o Yes [Record any error messages]

48. After 10 minutes of charging at {Charger X}, did {Vehicle Y}'s dashboard display any error messages?
o No
o Yes [Record any error messages]

49. After 10 minutes of charging at {Charger X}, did {Vehicle Y}'s charging port display any error messages?
o No
o Yes [Record any error messages]

50. After 10 minutes of charging at {Charger X}, did the {EVSE App}'s display any error messages?
o No
o Yes [Record any error messages]

4.5 Getting Help:

51. Is there customer service contact information on/near {Charger X}?
o No
o Yes
[If No, skip remaining questions in section]

52. What type of contact information is available {Charger X}? [Checkbox]
o Phone number (to CPO)
o Phone number (to on-site personnel)
o Chat message
o Help button
o Website
o QR Code
o Other (please specify): _____

53. Could you successfully contact a real or AI customer service agent?
o No
o Yes
o The charger worked so did not need to
[If "Yes" was not selected, skip remaining questions in section 4.5]

54. How long did you wait before you initiated contact with a customer service agent?
□ Float-only Entry Box

55. How would rate the contacted customer service agent's technical knowledge about EV charger?
o Extremely Lacked Technical Knowledge: The customer service agent displayed a severe lack of technical knowledge about EV chargers, which hindered their ability to assist with the broken charger effectively.
o Somewhat Lacked Technical Knowledge: The customer service agent had some technical knowledge gaps, which impacted their ability to provide comprehensive assistance with the broken EV charger.
o Neutral (Average Technical Knowledge): The customer service agent's technical knowledge was neither particularly noteworthy nor exceptionally lacking. Their technical knowledge was average, and the effectiveness of assistance was in line with this.
o Demonstrated Adequate Technical Knowledge: The customer service agent demonstrated adequate

technical knowledge about EV chargers, contributing to a satisfactory resolution of the broken charger issue.
o Highly Knowledgeable about EV chargers: The customer service agent displayed a high level of technical knowledge about EV chargers, resulting in a successful and efficient resolution of the broken charger problem.

56. How would you rate the general helpfulness of the customer service agent?
o Extremely Unhelpful: The customer service agent was unresponsive, provided incorrect information, and did not make any effort to assist with the broken EV charger issue. The interaction was entirely unsatisfactory, and no progress was made in resolving the problem.
o Somewhat Unhelpful: The customer service agent made minimal effort to assist with the broken EV charger issue but fell short of being genuinely helpful. The interaction left room for improvement, and there was limited progress in resolving the problem.
o Neutral: The customer service agent's assistance with the broken EV charger issue was neither particularly helpful nor unhelpful. The interaction was average or did not leave a strong impression in either direction, and there was limited progress made.
o Somewhat Helpful: The customer service agent was reasonably helpful in addressing the issue with the broken EV charger, but there were still some aspects that could have been improved, and the issue may not have been fully resolved.
o Extremely Helpful: The customer service agent was highly responsive, provided accurate information, and made a significant effort to assist with the broken EV charger issue, resulting in a successful resolution. The interaction was exceptionally satisfactory, and the problem was effectively resolved.
Was the customer service agent already aware of {Charger X}'s problem?
o No
o Yes
[If No, skip remaining questions in section]

57. How did the customer service agent become aware of {Charger X}'s problem?
o OCPP/OCPI/internal telemetry
o Consumer Complaint
o Through routine maintenance work
o Other, please explain: ____

58. Did the customer service agent provide an estimated fault resolution time for {Charger X}'s problem?
o No
o Yes, record resolution time: ___

59. According to the customer service agent, what was the reason behind {Charger X}'s failure?
□ Textbox