Lead the Charge. Drive Solar!

December 5, 2018

Mr. James Kwon
EPA Product Manager
US Environmental Protection Agency
Office of Air and Radiation
1200 Pennsylvania Ave., NW
Washington, DC 20460

RE: Paired Power Comments on Energy Star Version 1.1 EVSE Specification

Dear Mr. James Kwon:

Paired Power, Inc. is grateful for this opportunity to provide feedback on the *ENERGY STAR Test Method for DC EVSE Draft 1, Rev. Nov-2018* for DC charging of electric vehicles (EV) being administered by the US EPA and for taking these comments into consideration.

ENERGY STAR EVSE Specification 1.1 (DC-Input/DC-Output) Recommendations

Paired Power submits the following suggestions with regards to *ENERGY STAR Test Method for DC EVSE Draft 1, Rev. Nov-2018*. The following is organized by line number in the EPA draft document:

Line 27—The definition of EVSE includes the phrase, "installed specifically for the purpose of delivering energy from the premises wiring to the electric vehicle." This definition is too limiting, as an EVSE might not require any connection to the premises wiring and might not draw any energy from conventional AC or DC wiring. Specifically, an off-grid solar photovoltaic EVSE does not require a connection to the premises wiring and therefore does not draw any energy from an external source. All the energy delivered to the EV is generated by an array of solar modules or other DC source that can be considered to be a part of the EVSE. In other words, the energy source is contained within the EVSE.

Line 48 (Figure 1a) and Lines 71 through 74—An off-grid EVSE can either be tested complete with an actual solar array or other DC source providing the energy, or by using a DC power supply to simulate the energy source. If a direct DC power source such as solar modules are included in the test, then the energy source is effectively inside the EVSE cabinet. If a power supply is used, then careful consideration must be made to simulate the output of the DC source such as solar panels, including the I-V (current-voltage) characteristics of the output. A solar module's output has a characteristic I-V curve that includes a region of relatively constant current at low voltages, followed by a knee in the curve where the output power is at a maximum (maximum power point, or MPP), leading to a smooth decline in current as the voltage approaches the so-called open-circuit voltage. In normal operation it is typical for the power electronics to adjust the operating point on the I-V curve as necessary. Most solar inverters, for example, try to operate the array at or near MPP. Any DC EVSE will similarly require the energy source (real or simulated) to provide an approximation of a solar array's I-V characteristic. At a minimum, the DC input power (line 71) should specify both the highest input voltage and the current limit. This is a piecewise linear approximation of the solar I-V curve, but protects the DC input of the EVSE from damage due to unlimited current. During testing of such an EVSE, it would be anticipated that the input power supply might not operate at full voltage, but would switch to a current-limited output with the voltage determined by the application.

Lines 101–104—Presumably the impact of ambient temperature on power consumption would be due to the efficiency of cooling of the power electronics. If an EVSE is passively cooled (i.e. no fans, liquid-filled radiators, etc.), then the impact of ambient temperature should be small, and testing at temperature extremes would add unnecessary complication and expense.

Line 113 — For off-grid, solar photovoltaic DC EVSE, it is not possible to deliver the precise loading conditions of Table 3. A solar powered off-grid DC EVSE delivers the current that is available from the sun at different points throughout the day, which translates into a variable output that may vary from as little as zero wattage first thing in the morning to as much as 20 kW at peak solar. Line 113 seems to contemplate a level of power output control that may not be possible with an off-grid DC EVSE. The recommendation here is to add a loading condition 0 to Table 3 for such direct DC, lower output, variable power sources, such as solar panels (perhaps a 3.5 kW category at 350V).

Line 117 — This is a measurement of the peak value of an AC waveform to the RMS value. This does not seem appropriate for a test using a direct DC power source, such as solar panels.

Line 120 — Similarly, measures of frequency response are not appropriate to direct DC power sources such as solar panels.

Lines 129 through 132 and Line 134 — Parameters such as power factor, apparent power, RMS measurements, and frequency are not applicable for a direct DC power source, such as solar panels. The suggestion is to restate and include appropriate measures for both AC and DC power sources.

Line 146 — As noted earlier, it is not practical to ship and erect large numbers of solar panels or a DC source such as an energy storage system to a testing site. Therefore, the testing standard should contemplate an alternative, power supply-based DC input source that simulates DC power from solar panels or energy storage.

Lines 192 through 197 — The following sections relating to display luminance as well as Line 263 — As noted earlier, some DC EVSE are controlled via a smartphone app, and the EVSE has no actual display panel. A smartphone user interface scenario should be contemplated in the testing document, because there will be no ability to test a display panel if that display panel is the user's personal smartphone.

Line 299 — Communications between the EV and EVSE for CCS connectors will take place on the SAE J1772 control pilot pin, but should include both the J1772 PWM signaling protocol and the IEC/ISO 15118 or DIN 70121 digital communications protocol as well. A DC EVSE may require digital communications for normal operation. This also impacts Sections 6.2 (lines 331–337), 6.3 (lines 338–352) and 6.4 (lines 353–402), which are organized by the J1772 control pilot state (A, B and C) but do not consider digital communications between the EV and EVSE.

Lines 306 and 307 — An off-grid DC EVSE must have an internal battery to power the internal electronics since there is no utility grid present to do so. Therefore, for off-grid DC EVSE the testing should be allowed to proceed with the battery enabled.

Line 351 — IEC 62301 appears to involve measurement of standby power for electrical appliances. This isn't applicable for an off-grid use case with a direct DC power input. Also, we recommend that the EPA considers the conditions of standby power for off-grid EVSE. Since such off-grid EVSE are self-contained and generate their own power source, they must internally consume some standby power to power their electronics, charge an internal battery, and provide nighttime lighting beneath solar canopies, etc. Since none of this standby power comes from the grid and all comes from a direct DC power source, such as solar, it shouldn't count against the measured efficiency of the charging sessions themselves.

Line 369 — As noted earlier, it is not possible to control the amount of light we get from the sun to generate power output at a specific level. The testing standard should contemplate a variable DC input source, such as solar panels.

Lines 391 through 394 — These AC power parameters are not applicable to a direct DC power source, such as the power from solar photovoltaics. It is suggested to clarify the power parameters to include a direct DC power source — for example, the RMS value of a DC voltage is simply the DC value. The line should restate the inclusion of both AC and DC charging sources.

Line 401, Table 3 — The testing standard should contemplate a variable DC input source, such as solar panels and should state a loading condition 0 in the table for such a scenario (for example, a lower power output such as 3.5 kW).

Our team would be happy to answer questions or brainstorm additional guidelines that embrace the spirit of the ENERGY STAR program without impeding innovation for EV charging infrastructure projects. We hope you'll adjust requirements in upcoming *Version 1.1* to reflect these more inclusive guidelines that will benefit EV drivers across the United States.

Sincerely,

D.T. (Tom) McCalmont
CEO
Paired Power, Inc.