AeroVironment Comments on EPA Energy Star draft EVSE proposals
9-30-16

Product Specification Eligibility Criteria Draft 2, Version 1.0
Final Draft Test Method, Rev. August-2016
EPA Files online
https://www.energystar.gov/products/spec/electric_vehicle_supply_equipment_pd

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1 (B) 2)   At end of this line change "secondary functions are" to "secondary functions may include". With this word change, the list is of examples, and not necessarily a complete list.

1 (B) 2) a)   Add to the list and make it the first item: "Safety functions such as ground fault protection and missing ground detection.

1 (B) 2) d)   Change to "communicating with the vehicle digitally". The pilot already communicates with the vehicle through voltage and pwm duty cycle.

1 (C) 2   Off Mode. The description is unclear. It states that the EVSE is powered up, not connected to a vehicle, and is in state A of J1772. In this state the pilot, defined above as a secondary function, is active. But the description of Off mode says the EVSE is only providing tertiary functions.

The statement "can only be entered or exited through manual intervention" is not very clear. Does it mean transitioning in and out of "off mode" by the action of user uncoupling or coupling the connector to the vehicle?

1 (C) 3) a)   Operation Mode
Wording suggestion: change "vehicle is connected and accepting energy" to "vehicle is connected, EVSE contactor is closed, and vehicle is drawing current". In AC charging, the vehicle controls when and how much current is flowing from the EVSE.

1 (C) 3) a)   Idle Mode
Wording suggestion: As noted above, AC EVSEs don't provide or control current to vehicles. Suggest changing "but is not actively providing current" to ", the contactor is closed, but the vehicle is not drawing current".

Table 1   Note re Off mode further description: It says the EVSE is providing only tertiary functions. But in state A, The EVSE is providing the pilot, which is a secondary function.

Idle mode further clarification: As noted above, the EVSE can only provide voltage to the vehicle. It is up to the vehicle to decide when to draw current. Suggest changing wording to: "Where the vehicle is connected, the EVSE contactor is closed, and the vehicle is not drawing current."

Partial On Mode: Note there is no "State B" in J1772, there is B1 and B2. Suggest changing wording to: "State B1 is when the vehicle is connected but the EVSE is not ready close the contactor. State B2 when the EVSE is ready to close the contactor but the vehicle is not yet ready.

1 (D) 2)   The definition given of average power is a formal definition of the average power through a single cycle of an AC power waveform, which is 1/60 second, or basically instantaneous on the time scale of what is happening in EV charging. Note that connected functions like demand response, managed charging and their associated WiFi, Cellular, or network communications are not going to draw constant power. It will depend on how much work the processor is doing, how much communication is happening. The power level for these functions will be highly variable depending on what is happening at any given moment. Average power measured over one cycle of 60Hz ac power is not an appropriate way to measure typical average energy usage by these functions. A much longer time window will be required. For example, an EVSE that reports interval date every 15 minutes may have have its energy consumption over 15 minutes measured, and from that energy calculate the average power consumption.

3.1.1   Regarding safety and product listing: The EPA should not under any circumstances allow EVSE products that cannot be installed in compliance with the National Electric Code (NEC) to be eligible for Energy Star rating. NEC 625.5 requires EVSE products to be listed by a Nationally Recognized Testing Laboratory (NRTL). Independent listing by an NRTL assures that products meet the applicable safety standards. The EPA proposal to allow manufacturers to simply "report which safety standards are met" is not acceptable. Some manufacturers of non-listed EVSE products self-report compliance to certain UL standards, but this is absolutely not the same thing as being listed by an NRTL to those same UL standards. Consumers may not know the difference between an NRTL listing and a statement in the product specs that it meets UL standards.

The primary purpose of an EVSE is to <u>safely</u> provide the means to connect electric power to a plug-in vehicle. EVSE product listing by an NRTL needs to be a requirement for eligibility for the Energy Star rating.

Note EPA requires compliance with UL standards in at least one other Energy Star product class: Electric water heaters:

B. Product Performance Requirements for Electric Water Heaters:

Table 1: Criteria for Qualified Electric Water Heaters

Criteria		ENERGY STAR Requirements
Energy Factor	≤ 55 gallons	EF ≥ 2.00
	> 55 gallons	EF ≥ 2.20
First Hour Rating		FHR ≥ 50 gallons per hour
Warranty		Warranty ≥ 6 years on sealed system
Safety		UL 174 and UL1995
Lower Compressor Cut-Off Temperature (Reporting Requirement Only)		Report ambient temperature below which the compressor cuts off and electric resistance only operation begins

https://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Water%20Heaters%20Version%203%200%20Program%20Requirements.pdf

3.2   Partial On Mode Requirements
Change the note to: "These requirements refer to the SAE J1772 states B1 and B2" (State B does not exist in J1772).

3.2.1   In the notes below the equation, it it is not clear what this means: "capability to wake the product from partial on mode". The EVSE is already awake if it is partial on mode (J1772 states B1 and B2).

In Table 2: Partial On Mode Power Allowances, there are allowances for WiFi, Ethernet, and Cellular communications. These allowances are stated to be based on spec sheets for these types communication modules. But there is a missing component -- the processor board that the communications module is connected to. This processor board is almost always separate and distinct from the EVSE control board. The EVSE control board typically has a processor running embedded code to perform all of the core EVSE functions. A processor board used to communicate via WiFi, Cellular, or Ethernet typically runs Linux to provide all of the needed functionality for whatever protocols are in use (e.g. OCPP, SEP2, ISO 15118). This processor board may have the communication module as part of the board, or may provide a socket for a Wifi or Cellular module to plug in to.

To summarize: the power allowances for network connectivity need to include an allowance for the processing that is needed, not just the power used for communications. We suggest a value of 2 Watts in addition to the communications allowance.

Power Allowance values for WiFi, Ethernet, Cellular
The definition of power previously in the document, is for the average of power over just one electrical cycle of the 60Hz input AC power. As noted above, this is

an exceedingly small interval when the goal is to determine how much energy is consumed by communications functions in an EVSE. The communications profile for an EVSE is generally very spikey - periodic bursts of a small amount of data. In order to accurately capture the energy consumed by these connected functions, it is necessary to measure the power over a relatively long period of time (for example the time between periodic communications, for example every 15 minutes for interval usage data). This measurement can be most practically be done using a suitably set-up energy meter.

3.4   Connected Functionality

We suggest deferring any "Connected Functionality" rating to a later Energy Star version. The reasons for deferral are as follows:

The description of qualifying Connected Functionality as Demand Response is too narrow. Demand response (DR) is the ability to curtail or shut off load from a dispatch signal. There are many other functions that EV charging can provide to benefit the grid with most being more useful than DR. For example, there is demand dispatch, which is tailoring the timing and rate of of charging. Demand Response is used only when there is a need to use less electricity. Demand Dispatch can be used virtually all the time that charging is taking place, through functions like grid frequency regulation ancillary service (as a variable load), local voltage support to aid in solar integration, timing of charging to match wind generation, etc. Some of these functions can be performed autonomously, or with local connectivity. A better name for "Connected Functionality" would be "Grid Friendly functionality".

A comment on consumer override functionality -- this is a good idea, but consumer override functionality may not always be a button or control on the EVSE itself. It could be through a phone app or a touch screen in a vehicle, either of which in most cases would be more useful to a driver than a control directly on the EVSE. We suggest that Energy Star remove the consumer override functionality from evaluation of EVSEs for Energy Star Connected Functionality rating.

Figure 1b   Remove from the figure "Electronic AC Load", as this load is not used in any of the testing required for Energy Star rating (since there are no Operating Mode Requirements expressed for eligibility for Energy Star rating. Remove the output current sensing as well for the same reason.

3F   Remove this whole section called "Test Load", as a Test Load is not needed to verify eligibility for Energy Star rating (testing only required for Partial On mode (J1772 states B1 and B2) and Idle mode (J1772 state C but no current flowing).

Replace with a description of the Vehicle Emulator Module (VEM) which is needed to get into J1772 states B1, B2, as needed for Partial On mode and Idle mode testing. Suggest eliminating switch marked S2 in Figure 3, and changing labeling switch marked S1 to S2 to match terminology in J1772.

3 G) 6)   Suggest removing measurement of Frequency. It will always be 60Hz nominal for this program. Minor variations in grid frequency are continual, and do not need to be measured or characterized for this program.

4.1 A)   There is no need to mount the EVSE to a thermally non conductive surface for these tests (why the requirement at all?). Also, note that the power consumption in Partial On mode and Idle Mode will be quite small.

5.1 A)9)   Reporting of input voltage and frequency should be nominal amounts, not exact values (the exact values will likely drift around during the conduct of the testing and will have essentially no impact on the results. For example, report as 208V, 60Hz, or 120V, 60Hz, etc.)

5.2   Remove this section on Off-Mode testing as there is no stated value of off mode power consumption required for eligibility for Energy Star rating.

5.4   Remove this section on Operation Mode testing as there is no stated value of Operation Mode power consumption required for eligibility for Energy Star rating.