



ENERGY STAR® Program Requirements for Electric Vehicle Supply Equipment

Partner Commitments

Following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacture and labeling of ENERGY STAR qualified products. The ENERGY STAR Partner must adhere to the following partner commitments:

Qualifying Products

1. Comply with current ENERGY STAR Eligibility Criteria, which define performance requirements and test procedures for Electric Vehicle Supply Equipment. A list of eligible products and their corresponding Eligibility Criteria can be found at www.energystar.gov/specifications.
2. Prior to associating the ENERGY STAR name or mark with any product, obtain written certification of ENERGY STAR qualification from a Certification Body recognized by EPA for Electric Vehicle Supply Equipment. As part of this certification process, products must be tested in a laboratory recognized by EPA to perform Electric Vehicle Supply Equipment testing. A list of EPA-recognized laboratories and certification bodies can be found at www.energystar.gov/testingandverification.

Using the ENERGY STAR Name and Marks

3. Comply with current ENERGY STAR Identity Guidelines, which define how the ENERGY STAR name and marks may be used. Partner is responsible for adhering to these guidelines and ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance. The ENERGY STAR Brand Book is available at www.energystar.gov/logouse.
4. Use the ENERGY STAR name and marks only in association with qualified products. Partner may not refer to itself as an ENERGY STAR Partner unless at least one product is qualified and offered for sale in the U.S. and/or ENERGY STAR partner countries.
5. Provide clear and consistent labeling of ENERGY STAR qualified Equipment.
 - 5.1. The ENERGY STAR mark must be clearly displayed:
 - 5.1.1. And permanently affixed to the front of the product or on/next to the machine nameplate;

Option for electronic labeling: In instances where an electronic display is present, manufacturers have the option of displaying an electronic label in place of a physical label in a corner of the display, at system start-up, between marketing segments, or at the beginning of a transaction, as long it meets the following requirements:

 - The ENERGY STAR mark in cyan, black, or white (as described in the ENERGY STAR Brand Book available at www.energystar.gov/logouse).

The electronic mark must display for a minimum of 5 seconds;

 - The ENERGY STAR mark must be at least 10% of the screen by area, may not be smaller than 76 pixels x 78 pixels, and must be legible.

EPA will consider alternative proposals regarding approach, duration, or size for electronic labeling on a case-by-case basis. In product literature (i.e., user manuals, spec sheets, etc.);
 - 5.1.2. On product packaging; and
 - 5.1.3. On the manufacturer's Internet site where information about ENERGY STAR qualified models is displayed.

Verifying Ongoing Product Qualification

6. Participate in third-party verification testing through a Certification Body recognized by EPA for Electric Vehicle Supply Equipment, providing full cooperation and timely responses, EPA/DOE may also, at its discretion, conduct tests on products that are referred to as ENERGY STAR qualified. These products may be obtained on the open market, or voluntarily supplied by Partner at the government's request.

Providing Information to EPA

7. Provide unit shipment data or other market indicators to EPA annually to assist with creation of ENERGY STAR market penetration estimates, as follows:
 - 7.1. Partner must submit the total number of ENERGY STAR qualified Electric Vehicle Supply Equipment shipped in the calendar year or an equivalent measurement as agreed to in advance by EPA and Partner. Partner shall exclude shipments to organizations that rebrand and resell the shipments (unaffiliated private labelers).
 - 7.2. Partner must provide unit shipment data segmented by meaningful product characteristics (e.g., type, capacity, presence of additional functions) as prescribed by EPA.
 - 7.3. Partner must submit unit shipment data for each calendar year to EPA or an EPA-authorized third party, preferably in electronic format, no later than March 1 of the following year.Submitted unit shipment data will be used by EPA only for program evaluation purposes and will be closely controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the Partner.
8. Report to EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.
9. Notify EPA of a change in the designated responsible party or contacts within 30 days using the My ENERGY STAR Account tool (MESA) available at www.energystar.gov/mesa.

Training and Consumer Education

10. Partner shall agree to complete steps to educate users about the benefits of more energy efficient products by including the following information with each EVSE (i.e., in the user manual or on a box insert):
 - 10.1. Energy saving potential;
 - 10.2. Financial saving potential;
 - 10.3. Environmental benefits;
 - 10.4. Information on ENERGY STAR and a link to www.energystar.gov; and
 - 10.5. ENERGY STAR logo (used in accordance with the ENERGY STAR Brand Book available at www.energystar.gov/logos).
11. At the manufacturer's request, EPA will supply suggested facts and figures related to the above criteria, template elements, or a complete template suitable for use in user guides or box inserts.

Performance for Special Distinction

In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures, and should keep EPA informed on the progress of these efforts:

- Provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and its message.
- Consider energy efficiency improvements in company facilities and pursue benchmarking buildings through the ENERGY STAR Buildings program.
- Purchase ENERGY STAR qualified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product information to employees for use when purchasing products for their homes.
- Feature the ENERGY STAR mark(s) on Partner website and other promotional materials. If information concerning ENERGY STAR is provided on the Partner website as specified by the ENERGY STAR Web Linking Policy (available in the Partner Resources section of the ENERGY STAR website), EPA may provide links where appropriate to the Partner website.
- Ensure the power management feature is enabled on all ENERGY STAR qualified displays and computers in use in company facilities, particularly upon installation and after service is performed.
- Provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR qualified products.
- Provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, EPA may be able to coordinate, and communicate Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR website, etc. The plan may be as simple as providing a list of planned activities or milestones of which Partner would like EPA to be aware. For example, activities may include: (1) increasing the availability of ENERGY STAR qualified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrating the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) providing information to users (via the website and user's manual) about energy-saving features and operating characteristics of ENERGY STAR qualified products; and (4) building awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event.
- Join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. The SmartWay Transport Partnership works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit www.epa.gov/smartway.
- Join EPA's Green Power Partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities. For more information on Green Power, visit www.epa.gov/greenpower.



ENERGY STAR® Product Specification for Electric Vehicle Supply Equipment

Eligibility Criteria Final Draft Version 1.0

1 Following is the Version 1.0 ENERGY STAR product specification for Electric Vehicle Supply Equipment.
2 A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

1 DEFINITIONS

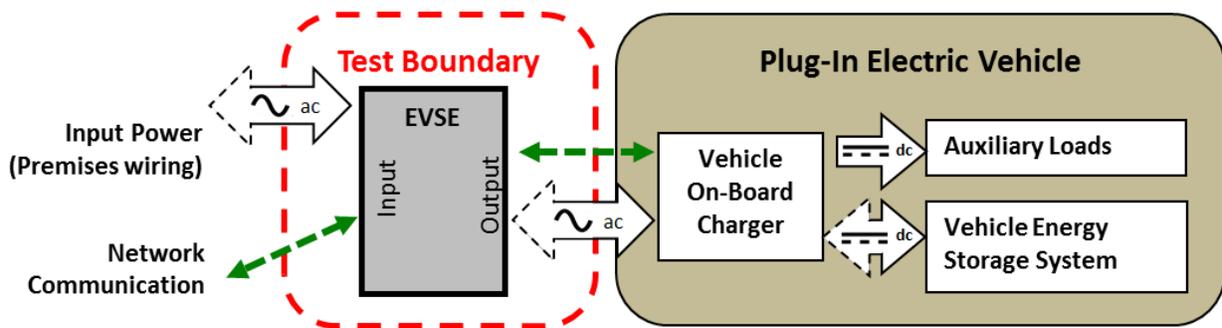
3
4 A) Electric Vehicle Supply Equipment (EVSE): The conductors, including the ungrounded, grounded,
5 and equipment grounding conductors, the electric vehicle connectors, attachment plugs, and all other
6 fittings, devices, power outlets, or apparatuses installed specifically for the purpose of delivering
7 energy from the premises wiring to the electric vehicle. Charging cords with NEMA 5-15P and NEMA
8 5-20P attachment plugs are considered EVSEs. Excludes conductors, connectors, and fittings that
9 are part of the vehicle.¹

10 1) Level 1: A galvanically-connected EVSE with a single-phase input voltage nominally 120 volts ac
11 and maximum output current less than or equal to 16 amperes ac.²

12 2) Level 2: A galvanically-connected EVSE with a single-phase input voltage range from 208 to 240
13 volts ac and maximum output current less than or equal to 80 amperes ac.²

14 3) Fast dc: A galvanically-connected EVSE that includes an off-board charger and provides dc
15 current greater than or equal to 80 amperes dc.

16 4) Wireless / Inductive: A non-galvanically-connected EVSE.
17



18
19 **Figure 1: Schematic of Overall Plug-In Vehicle Charging System detailing EVSE Test Boundary**

20 B) EVSE Functions:

21 1) Primary Function: Providing current to a connected load.

22 2) Secondary Function: Function that enables, supplements or enhances a primary function. For
23 EVSE, examples of Secondary Functions are:

24 a) Safety functions (e.g., ground fault protection, missing ground detection, etc.)

¹ SAE J2894-1 Section 3.10.

² This definition is intended to be consistent with the requirements in SAE J1772, with some additional clarifications.

- 25 b) Automatic Brightness Control (ABC): The self-actin
 26 of a display or lamp as a function of ambient light.
- 27 c) Full Network Connectivity: The ability of the EVSE to
 28 Partial On mode.
- 29 Note: Presence of the EVSE's network services, its
 30 maintained even if some components of the EVSE
 31 to change power states based on receipt of network
 32 should otherwise stay in a low power mode absent
 33 network device.
- 34 d) Occupancy Sensing: detection of human or object
 35 surrounding an EVSE.
- 36 e) Digitally communicating with the vehicle;
- 37 f) Illumination of display, indicator lights, or ambient lighting;
- 38 g) Public access control (RFID card, authorization, etc.);
- 39 h) Control Pilot Signal;
- 40 i) Wake-up function.

The scope of this document is level 1 and 2 AC charging, there is no digital communication between EV and EVSE on level 1 or 2. Pilot is an analog signal. J1772 states are 12 V dc, 9 V dc, 6 V dc, 3 V dc, 0 V dc, and -12 V dc. Available current is via % duty cycle of a PWM signal, again, not digital. DC fast charging communication is digital, but dc is not in scope. Was this intended for future use?

The pilot signal is a analog signal, not digital. Not applicable yet, is this for future use?

Note: Due to stakeholder feedback, EPA has made minor changes to the specification to add more clarity to the definition of Secondary Functions: indicating that the list provided includes examples and not a complete list of secondary functions, adding safety functions to the list, and clarifying that communication with the vehicle is digital since the control pilot is also in communication with the vehicle.

- 45 3) Tertiary Function: Function other than a primary or a secondary function.
- 46 Example: An EMC filter and status indication provides their function in No Vehicle, Partial On
 47 Mode, and On Mode.
- 48 C) EVSE Operational Modes and Power States:
- 49 Note: The transition period to a different mode; whether automatically initiated, or via user action;
 50 does not constitute a mode.
- 51 1) Disconnected: Condition of the equipment during which all connections to power sources
 52 supplying the equipment are removed or galvanically isolated and no functions depending on
 53 those power sources are provided. The term power source includes power sources external and
 54 internal to the equipment.
- 55 2) No Vehicle Mode: Condition during which the equipment is connected to external power and is
 56 only providing tertiary function(s). No Vehicle Mode is intended to be the lowest-power mode of
 57 the EVSE that can only be entered or exited through manual intervention (product is physically
 58 disconnected from vehicle).
- 59 Note: The vehicle-EVSE interface is in State A of SAE J1772, where the vehicle is not
 60 connected.³
- 61 3) On Mode: Condition during which the equipment provides the primary function or can promptly
 62 provide the primary function.
- 63 a) Operation Mode: Condition during which the equipment is performing the primary function.
- 64 Note: The vehicle-EVSE interface is in State C, where the vehicle is connected and accepting
 65 energy.³

³ This mode is intended to be associated with a vehicle/EVSE interface state (e.g., A, B, or C) as defined in SAE J1772.

66 b) Idle Mode: Condition during which the equipment can promptly provide the primary function
 67 but is not doing so.

68 Note: Idle mode is the condition within On Mode where the EVSE is connected to the vehicle
 69 or vehicle simulator but is not actively providing current. The vehicle-EVSE interface is in
 70 State C, where the vehicle is connected and ready to accept energy.³

71 4) Partial On Mode: Condition during which the equipment provides at least one secondary function
 72 but no primary function.

73 Note: The vehicle-EVSE interface is in State B1 or B2, where the vehicle is connected but not
 74 ready to accept energy and the EVSE is or is not ready to supply energy.³

75 **Table 1: Operational Modes and Power States**

Operational Modes	Most closely related Interface State as Defined in SAE J1772	Further Description
No Vehicle Mode	State A	No Vehicle Mode is associated with State A, or where the EVSE is not connected to the EV. The EVSE is connected to external power and is providing only tertiary functions.
Partial On Mode	State B1 or State B2	Partial On Mode is associated with State B1 or State B2 where the vehicle is connected but is not ready to accept energy. Sub-state B1 is where the EVSE is not ready to supply energy and sub-state B2 is where the EVSE is ready to supply energy.
On Mode		
Idle Mode	State C	Idle Mode is associated with State C, where the vehicle is connected and ready to accept energy and the EVSE is capable of promptly providing current to the EV but is not doing so.
Operation Mode	State C	Operation Mode is associated with State C, where the EVSE is providing the primary function, or providing current to a connected load (i.e., the relay is closed and the vehicle is not drawing

There is only one state C, that is when the EVSE has closed the contacts between the AC mains source and the vehicle. Whether the vehicle draws power or not is not under the control of the EVSE. Whether the vehicle draws current or not does not create an additional state for the EVSE.

77 **Note:** In response to stakeholder feedback, EPA changed the term 'Off Mode' to 'No Vehicle Mode' but
 78 maintained the same definition, per stakeholder feedback that 'Off Mode' was a confusing term. 'No
 79 Vehicle Mode' most closely relates to State A in SAE J1772, a mode in which the EVSE is not physically
 80 connected to the vehicle. In addition, EPA has altered the definition of Partial On Mode to be associated
 81 with State B1 or State B2 to align with the most recent version of the SAE J1772 standard.

82 5) Power Management: Automatic control mechanism that achieves the smallest power consistent
 83 with a pre-determined level of functionality.

84 D) Other:

- 85 1) Apparent power (S): The product of RMS voltage and RMS current, which is equal to magnitude
 86 of the complex power, and measured in volt-amperes (VA).
- 87 2) Average Power (P) (also Real Power): The power in a circuit which is transformed from electric to
 88 non-electric energy and is measured in watts (W). For a two-terminal device with instantaneous
 89 current and voltage waveforms $i(t)$ and $v(t)$ which are periodic with period T , the real or average
 90 power P is⁴:

$$P = \frac{1}{T} \int_0^T v(t)i(t)dt$$

- 91
- 92 3) Duty Cycle: The ratio of a given time interval of the uninterrupted duration at the high logic state
 93 to the total time.

94 Note: This duty cycle, lying between 0 and 1, may be expressed as a percentage.

- 95 4) Power Factor (PF): The ratio of the average power (P) in watts to the apparent power (S) in volt-
 96 amperes.

$$PF = \frac{P}{S}$$

- 97
- 98 5) Unit Under Test (UUT): The specific sample of a representative model undergoing measurement
 99 which includes the base product and any accessories packaged with it.
- 100 6) Illuminance: means the luminous flux per unit area of light illuminating a given surface, expressed
 101 in units of lux.
- 102 7) Luminance: The photometric measure of the luminous intensity per unit area of light travelling in a
 103 given direction, expressed in candelas per square meter (cd/m^2).
- 104 8) High Resolution Display: A screen device that converts a video signal into a visual output and is
 105 capable of displaying a minimum of 480x234 native resolution and has a backlight (e.g., LCD
 106 panel, OLED panel).

107 **Note:** EPA has added a definition for luminance to inform the measurement of Luminance in the Test
 108 Method.

109 EPA has also included a definition for a high resolution display in addition to an adder for these displays.
 110 The power allowance for EVSE with displays is intended for backlight screens that can display dynamic
 111 content, namely LCDs and OLEDs. In speaking with manufacturers, EPA found that such displays—
 112 which typically use more power due to their backlight and resolution—are most prevalent in products
 113 aimed at the commercial market for use in public spaces, where consumers must be able to easily identify
 114 and use the EVSE under both bright and dim illuminance conditions.

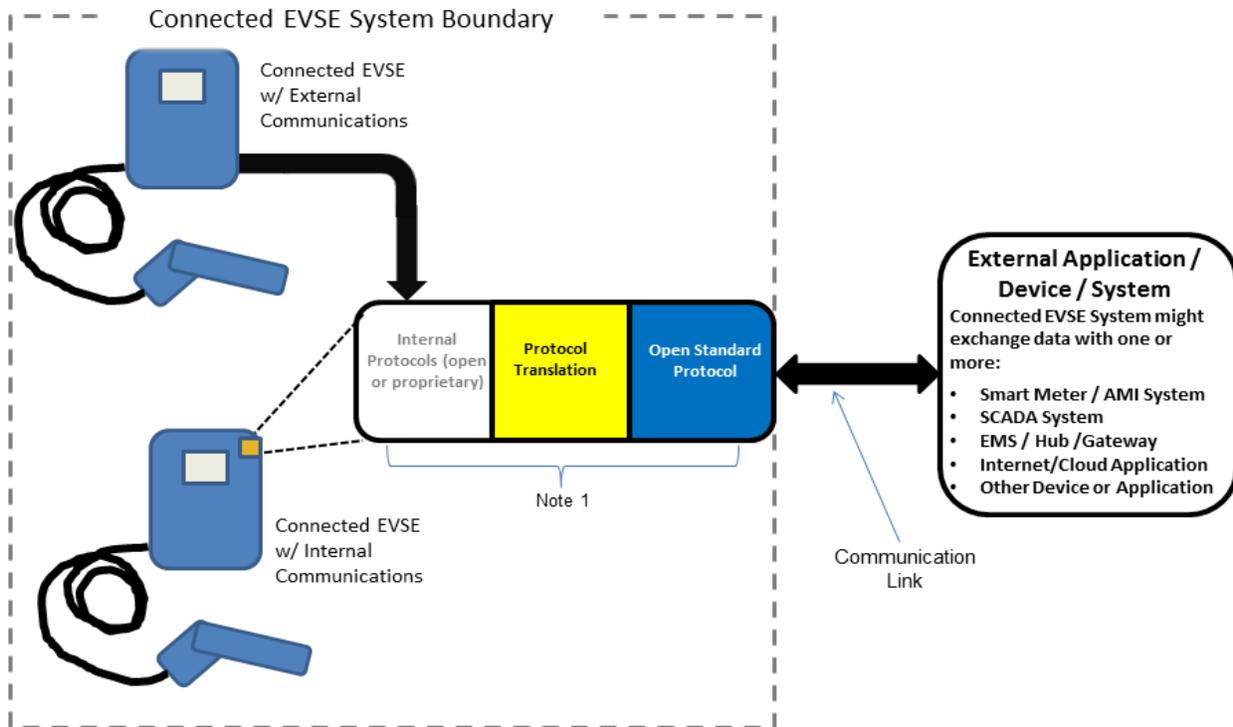
- 115 E) Product Family: A group of product models that are (1) made by the same manufacturer, (2) subject
 116 to the same ENERGY STAR qualification criteria, and (3) of a common basic design. Product models
 117 within a family differ from each other according to one or more characteristics or features that either
 118 (1) have no impact on product performance with regard to ENERGY STAR qualification criteria, or (2)
 119 are specified herein as acceptable variations within a Product Family. For EVSE, acceptable
 120 variations within a Product Family include:

- 121 1) Color,
 122 2) Output cable, and
 123 3) Housing.

- 124 F) Connected Functionality Definitions

⁴ Average power is intended to align with the definition of real power in SAE J2894.

- 125 1) Communication Link: The mechanism for bi-directional data transfers between the EVSE and one
 126 or more external applications, devices or systems.
- 127 2) Demand Response (DR): Changes in electric usage by demand-side resources from their normal
 128 consumption patterns in response to changes in the price of electricity over time, or to incentive
 129 payments designed to induce lower electricity use at times of high wholesale market prices or
 130 when system reliability is jeopardized⁵.
- 131 3) Demand Response Management System (DRMS): The system operated by a program
 132 administrator, such as the utility or third party, which dispatches signals with DR instructions
 133 and/or price signals to the ENERGY STAR EVSE and receives messages from the EVSE.
- 134 4) EVSE System: As shown in Figure 2, it includes the ENERGY STAR certified EVSE, integrated or
 135 separate communications hardware, and additional hardware and software required to enable
 136 connected functionality.
- 137 5) Load Management Entity: DRMS, home energy management system, etc.



138
 139 **Figure 2: Connected EVSE System**

140 Note: Communication device(s), link(s) and/or processing that enables Open Standards-based
 141 communication between the EVSE and external application / device / system(s). These elements, either
 142 individually or together, could be within the EVSE, and/or an external communication module, a
 143 hub/gateway, or in the Internet/cloud.

144 G) Open Standards: Standards that are:

⁵ Federal Energy Regulatory Commission, <https://www.ferc.gov/industries/electric/indus-act/demand-response/dr-potential.asp>

- 145 1) Included in the Smart Grid Interoperability Panel (SGIP) Catalog of Standards,⁶ and/or
146 2) Included in the National Institute of Standards and Technology (NIST) Smart Grid framework
147 Tables 4.1 and 4.2,⁷ and/or
148 3) Adopted by the American National Standards Institute (ANSI) or another well-established
149 international standards organization such as the International Organization for Standardization
150 (ISO), International Electrotechnical Commission (IEC), International Telecommunication Union
151 (ITU), Institute of Electrical and Electronics Engineers (IEEE), or Internet Engineering Task Force
152 (IETF).

153 H) **Acronyms:**

- 154 1) A: Ampere
155 2) ABC: Automatic Brightness Control
156 3) ac: Alternating Current
157 4) dc: Direct Current
158 5) DOE: U.S. Department of Energy
159 6) DR: Demand Response
160 7) EPA: Environmental Protection Agency
161 8) EVSE: Electric Vehicle Supply Equipment
162 9) IEC: International Electrotechnical Commission
163 10) IEEE: Institute of Electrical and Electronics Engineers
164 11) NEMA: National Electrical Manufacturers Association
165 12) SAE: Society of Automotive Engineers
166 13) UUT: Unit Under Test
167 14) V: Volt
168 15) W: Watts

169 **2 SCOPE**

170 **2.1 Included Products**

- 171 2.1.1 Level 1 EVSE.
172 2.1.2 Level 2 EVSE.
173 2.1.3 Dual Input Level 1 and Level 2 EVSE.

174 **2.2 Excluded Products**

- 175 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for
176 certification under this specification. The list of specifications currently in effect can be found at
177 www.energystar.gov/specifications.

⁶ http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PMO#Catalog_of_Standards_Processes

⁷ http://www.nist.gov/smartgrid/upload/NIST_Framework_Release_2-0_corr.pdf

- 178 2.2.2 Dc Output EVSE.
- 179 2.2.3 Wireless/Inductive EVSE.
- 180 2.2.4 Power electronic components in

The standards are not 'National Electric Code safety standards. The National Electrical Code is NFPA 70 which is an installation document. Article 625.5 states that EVSE must be 3rd party listed for safety. The stakeholders request was that Energy Star require the same, namely that products must carry NRTL Listing in order to be eligible for Energy Star, this is NOT the same as a statement that the EVSE brand owner report which standards are met. Please, this is very important to the consumer and this industry to not have to compete against products that do not comply with US safety requirements. The mentioned UL standards are UL/ANSI standards, not 'National Electric Code safety standards' Certain unscrupulous operators will make claims. This was a unanimous request of all stakeholders. Not one person in writing or present at the webinar opposed this request. This verbiage does NOT protect the consumer or industry. Please change to specify that listing is required!!

181 **3 CERTIFICATION CRITERIA**

182 **3.1 Significant Digits and Rounding**

- 183 3.1.1 All calculations shall be carried out to a precision of at least 3 significant digits. The final result of a calculation shall be rounded to the least number of significant digits of any of the inputs.
- 184
- 185 3.1.2 Unless otherwise specified with a tolerance, all values shall be evaluated using exact values without rounding.
- 186
- 187 3.1.3 Directly measured or calculated values shall be rounded to the nearest 0.1% of the specification limit.
- 188
- 189

190 **3.2 General Requirements**

- 191 3.2.1 For each EVSE, EVSE brand owners shall report which of the following National Electric Code product safety standards are met:
- 192
- 193
 - UL 2594
 - 194 • UL 2231
 - 195 • UL 1998

Note: Again in Draft 2, EPA received feedback from stakeholders that products that do not adhere to safety standards may demonstrate lower power consumption, given differences in how the products are constructed. Stakeholders provided input that the EVSE market has not universally adhered to safety standards and that doing so remains a differentiating feature among EVSE products. To offset any incentive for product manufacturers to forgo safety standards in the interest of saving energy and to ensure that ENERGY STAR qualified products meet consumer quality expectations, based on stakeholder input, EVSE brand owners shall report which National Electric Code safety standards are met. EPA intends to include this information for purchasers in the ENERGY STAR product finder.

- 204 3.2.2 Dual input Level 1 and Level 2 EVSE shall meet all requirements and report information in both configurations.
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206 **3.3 No Vehicle Mode Requirements**

207 Note: These requirements refer to the SAE J1772 State A.

- 208 3.3.1 Measured No Vehicle Mode power ($P_{NO_VEHICLE}$) shall be less than or equal to the Maximum No Vehicle Mode Power Requirement ($P_{NO_VEHICLE_MAX}$), as calculated per Equation 1, subject to the following requirements.
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- 210
- 211
 - i. For products with ABC enabled by default, the average No Vehicle Mode power in high and low illuminance conditions shall be used in place of $P_{NO_VEHICLE}$, above.
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213 **Equation 1: Calculation of Maximum No Vehicle Mode Power Requirement**

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$$P_{NO_VEHICLE_MAX} = 2.6 + \sum_{i=1}^n P_{WAKE_i}$$

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Where:

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- $P_{NO_VEHICLE_MAX}$ is the Maximum No Vehicle Mode Power Requirement;

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- P_{WAKE_i} is the sum of the No Vehicle Mode power allowance for each applicable product function listed in Table 2, for a total of n such allowances.

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Table 2: No Vehicle Mode Power Allowances

Product Function	No Vehicle Mode Power Allowance (watts, rounded to the nearest 0.1 W for reporting)
In-use Wi-Fi or Ethernet Interface with Wake Capability (P_{WAKE_i})	$\frac{1.0}{n}$ <p>Where:</p> <ul style="list-style-type: none"> • n is the number of outputs.
In-use Cellular with Wake Capability (P_{WAKE_i})	$\frac{2.0}{n}$ <p>Where:</p> <ul style="list-style-type: none"> • n is the number of outputs.
Other In-use LAN (Local Area Network) Interface with Wake Capability (P_{WAKE_i})	$\frac{1.0}{n}$ <p>Where:</p> <ul style="list-style-type: none"> • n is the number of outputs.
In-use High Resolution Display (P_{WAKE_i})	$\frac{[(4.0 \times 10^{-5} \times \ell \times A) + 119 \times \tanh(0.0008 \times [A - 200.0] + 0.11) + 6.0]}{n}$ <p>Where:</p> <ul style="list-style-type: none"> • A is the Screen Area in square inches; • ℓ is the Maximum Measured Luminance of the Display in candelas per square meter, as measured in Section 4) C) of the ENERGY STAR Test Method for Determining Electric Vehicle Supply Equipment Energy; • \tanh is the hyperbolic tangent function; and • n is the number of outputs. <p>The result shall be rounded to the nearest tenth of a watt for reporting.</p> <p>Example: For a single-output EVSE with a maximum measured luminance of 300 candelas/m² and a 5x5 inch screen, the allowance for the in-use display would be 2.7 watts.</p>

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Note: In response to Draft 2, stakeholders relayed that energy efficiency criteria were missing for a mode in which the EVSE is not physically connected to the vehicle but still drawing power. Stakeholders recommended that this mode be defined as “No Vehicle Mode” to clarify that the EVSE is not physically connected to the vehicle. For completeness in defining all possible modes, EPA had previously defined this mode as “Off Mode” in Draft 2. EPA proposes replacing the term “Off Mode” with “No-Vehicle Mode”, while keeping the same definition, which aligns with interface State A defined in SAE J1772.

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Based on another review of test data assembled, EPA saw an opportunity to differentiate products’ power consumption in No Vehicle Mode. As such, EPA proposes the same base criteria and allowances for No Vehicle Mode as for both Partial On and Idle Modes, based on an analysis of the data indicating that such levels continue to capture top-performing EVSE models.

232 Stakeholders also provided feedback to the Draft 2 Follow Up Memo that EPA released October 28,
233 2016, outlining treatment of EVSE with multiple ports. Some noted that networking and display functions
234 are unlikely to be duplicated for multiple-output EVSE and at least one manufacturer is able to achieve
235 lower power draw for shared features in multi-port EVSE. As such, EPA has made a modification to this
236 Final Draft by adding a $1/n$ factor to all these allowances, such that when the measured power of these
237 multiple-output products is divided by the number of outputs, the allowances are scaled accordingly. In
238 doing so, EPA seeks to incentivize more energy efficient implementation of key features via one shared
239 housing. EPA proposes the same treatment for allowances for Partial On and Idle Modes in EVSE with
240 multiple ports.

241 3.4 Partial On Mode Requirements

242 Note: These requirements refer to the SAE J1772 State B1 or State B2.

243 3.4.1 Measured Partial On Mode power ($P_{PARTIAL_ON}$) shall be less than or equal to the Maximum Partial
244 On Mode Power Requirement ($P_{PARTIAL_ON_MAX}$), as calculated per Equation 2, subject to the
245 following requirements.

- 246 i. For products with ABC enabled by default, the average Partial On Mode power in high and
247 low illuminance conditions shall be used in place of $P_{PARTIAL_ON}$, above.

248 Equation 2: Calculation of Maximum Partial On Mode Power Requirement

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$$P_{PARTIAL_ON_MAX} = 2.6 + \sum_{i=1}^n P_{WAKE_i}$$

250 Where:

- 251 ▪ $P_{PARTIAL_ON_MAX}$ is the Maximum Partial On Mode Power
252 Requirement;
- 253 ▪ P_{WAKE_i} is the Partial On Mode power allowance for each
254 applicable product function listed in Table 3, for a total of n such
255 allowances.

Table 3: Partial On Mode Power Allowances

Product Function	Partial On Mode Power Allowance (watts, rounded to the nearest 0.1 W for reporting)
In-use Wi-Fi or Ethernet Interface with Wake Capability (P_{WAKE_i})	$\frac{1.0}{n}$ <i>Where:</i> <ul style="list-style-type: none"> n is the number of outputs.
In-use Cellular with Wake Capability (P_{WAKE_i})	$\frac{2.0}{n}$ <i>Where:</i> <ul style="list-style-type: none"> n is the number of outputs.
Other In-use LAN (Local Area Network) Interface with Wake Capability (P_{WAKE_i})	$\frac{1.0}{n}$ <i>Where:</i> <ul style="list-style-type: none"> n is the number of outputs.
In-use High Resolution Display (P_{IDLE_i})	$\frac{[(4.0 \times 10^{-5} \times \ell \times A) + 119 \times \tanh(0.0008 \times [A - 200.0] + 0.11) + 6.0]}{n}$ <i>Where:</i> <ul style="list-style-type: none"> A is the Screen Area in square inches; ℓ is the Maximum Measured Luminance of the Display in candelas per square meter, as measured in Section 4) C) of the ENERGY STAR Test Method for Determining Electric Vehicle Supply Equipment Energy; \tanh is the hyperbolic tangent function; and n is the number of outputs. The result shall be rounded to the nearest tenth of a watt for reporting. Example: For a single-output EVSE with a maximum measured luminance of 300 candelas/m ² and a 5x5 inch screen, the allowance for the in-use display would be 2.7 watts.

257 **Note:** EPA has maintained the same criteria for Partial On Mode that was seen in the Draft 2
 258 Specification. However, based on another review of test data assembled, EPA saw that the power
 259 consumption for Partial On Mode is not always lower than that for Idle Mode. To ensure energy savings,
 260 EPA has removed the exemption for products whose Idle Mode meet the criteria for Partial On to not be
 261 required to test and meet the separate Partial On Mode requirements.

262 **3.5 Idle Mode Requirements**

263 Note: These requirements refer to the SAE J1772 State C.

264 3.5.1 Measured Idle Mode power (P_{IDLE}), shall be less than or equal to the Maximum Idle Mode Power
 265 Requirement (P_{IDLE_MAX}), as calculated per Equation 3, subject to the following requirements.

- 266 i. For products with ABC enabled by default, the average Idle Mode power in high and low
 267 illuminance conditions shall be used in place of P_{IDLE} , above.

268 **Equation 3: Calculation of Maximum Idle Mode Power Requirement**

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$$P_{IDLE_MAX} = (0.4 \times \text{Max Current}) + 2.6 + \sum_{i=1}^n P_{IDLE_i}$$

270 *Where:*

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- P_{IDLE_MAX} is the Maximum Idle State Power Requirement, in watts;
- Max Current is the Nameplate Maximum Current; and
- P_{IDLE_i} is the Idle State power allowance for each applicable product function listed in Table 4, for a total of n such allowances.

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Table 4: Idle State Power Allowances

Product Function	Idle State Power Allowance (watts, rounded to the nearest 0.1 W for reporting)
In-use Wi-Fi or Ethernet Interface with Wake Capability (P_{IDLE_i})	$\frac{1.0}{n}$, <i>Where:</i> • n is the number of outputs.
In-use Cellular with Wake Capability (P_{IDLE_i})	$\frac{2.0}{n}$, <i>Where:</i> • n is the number of outputs.
In-use LAN (Local Area Network) Interface with Wake Capability (P_{IDLE_i})	$\frac{1.0}{n}$, <i>Where:</i> • n is the number of outputs.
In-use High Resolution Display (P_{IDLE_i})	$[(4.0 \times 10^{-5} \times \ell \times A) + 119 \times \tanh(0.0008 \times [A - 200.0] + 0.11) + 6.0] / n$ <i>Where:</i> • A is the Screen Area in square inches; • ℓ is the Maximum Measured Luminance of the Display in candelas per square meter, as measured in Section 4) C) of the ENERGY STAR Test Method for Determining Electric Vehicle Supply Equipment Energy; • \tanh is the hyperbolic tangent function; and • n is the number of outputs. The result shall be rounded to the nearest tenth of a watt for reporting. Example: For a single-output EVSE with a maximum measured luminance of 300 candelas/m ² and a 5x5 inch screen, the allowance for the in-use display would be 2.7 watts.

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Note: In the Draft 2 Specification, relay power was accounted for by a factor of $0.25 \times$ Max Current for each model. In the Final Draft Specification, EPA has amended this factor to $0.4 \times$ Max Current due to stakeholder feedback on the need to allow for more overhead in power allowance to be able to right-size the relay for the size of the EVSE, which ensures a safe relay connection. The reflected change will allow all products with the exception of one outlier to meet the requirements for relay power, ensuring that a range of EVSE sizes requiring higher relay power are eligible to meet the specification requirements.

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3.6 Connected Functionality

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This section includes connected criteria for ENERGY STAR certified EVSE Systems. EVSE that meet the connected functionality criteria shall be capable of supporting Demand Response (DR) (e.g., via software updates or integration with an external service). Compliance with this section is optional. ENERGY STAR certified EVSE that comply with all connected criteria will be identified on the ENERGY STAR website as having ‘Connected’ functionality.

290 Note: EPA recommends that once DR capability is added, that the EVSE be capable of directly or
291 indirectly supporting both signals based DR as well as price response. As appropriate, EPA further
292 encourages connected functionality that enables direct control by the Load Management Authority as well
293 as integration with commercial EVSE management applications and/or energy management systems.
294 Brand owners are encouraged to engage with utilities to ensure DR capabilities align with utility needs
295 and DR program designs.

296 **Note:** EPA clarified the intent of allowing an ENERGY STAR EVSE product to be listed as meeting
297 Connected Functionality criteria if the model is capable of supporting DR. In addition, EPA has added a
298 permanent notetext with broad recommendations for DR capable EVSE to employ certain functionalities,
299 per stakeholder feedback that this would be beneficial.

300 3.6.1 Grid Communications: The product shall include a communication link that is capable of
301 supporting DR. This link shall use open standards, as defined in this specification, for all
302 communication layers.

303 i. Products that include a communication link that uses Open Charge Point Protocol (OCPP)
304 also comply with this criterion.

305 Note: Effective November 24, 2015 OCPP is being developed by OASIS as the Standard
306 Development Organization with a goal of integrating OCPP with the International
307 Electrotechnical Commission (IEC) framework⁸. EPA is proposing to include OCPP since it is
308 widely used and is in the process of being established as an open standard.

309 3.6.2 Open Access: To enable interconnection with the product over the communication link, an
310 interface specification, application programming interface (API) or similar documentation that is
311 intended to enable DR functionality shall be made readily available.

312 Note: Products that enable direct, on-premises, open-standards based interconnection are
313 preferred, but alternative approaches, where open-standards connectivity is enabled only with
314 use of off-premise services, are also acceptable.

315 3.6.3 Consumer Override: The product shall be capable of supporting DR event override-ability by
316 consumers.

317 3.6.4 Capabilities Summary: A ≤250 word summary description of the EVSE system's and/or
318 associated Service Provider's DR capabilities/services shall be submitted. In this summary, EPA
319 recommends noting the following, as applicable:

- 320 i. DR Support, e.g., implemented, planned for CY2017.
- 321 ii. DR services that the product has the capability to participate in such as load dispatch,
322 ancillary services (including V2G), price notification and price response .
- 323 iii. Whether the EVSE can be directly addressed via the interface specification, API or
324 similar documentation.
- 325 iv. Support for locational DR, e.g., to ZIP code(s), feeder(s), or to EVSE endpoints specified
326 by the Load Management Entity.
- 327 v. List open communications supported by the EVSE, including applicable certifications.
- 328 vi. Feedback to Load Management Entity, e.g., verification/M&V, override notification.
- 329 vii. Response configurability/flexibility by the consumer and/or Load Management Entity.
- 330 viii. Feedback to Load Management Entity, e.g., verification/M&V, override notification.

⁸ <http://www.openchargealliance.org/news/announcement/>

- 331 ix. Measures to limit consumer impacts, if any.
- 332 x. For products that do not ship with DR capabilities enabled, manufacturers are
- 333 encouraged to clarify the steps needed to enable these capabilities.

334 **Note:** EPA has clarified and updated the recommended content for the capabilities summary to align with

335 feedback provided by stakeholders.

336 **4 TESTING**

337 **4.1 Test Methods**

338 4.1.1 Test methods identified in Table 5 shall be used to determine certification for ENERGY STAR.

339 **Table 5: Test Methods for ENERGY STAR Certification**

Product Type	Test Method
All Electric Vehicle Supply Equipment	ENERGY STAR Electric Vehicle Supply Equipment Test Method (Rev. Dec-2016)
Electric Vehicle Supply Equipment with In-use High Definition Display	ENERGY STAR Test Method for Determining Display Energy (Rev. Sep-2015)
Electric Vehicle Supply Equipment with Full Network Connectivity	Section 6.7.5.2 of Consumer Electronics Association (CEA) 2037-A, Determination of Television Set Power Consumption

340 **4.2 Number of Units Required for Testing**

341 4.2.1 Representative Models shall be selected for testing per the following requirements:

- 342 i. For certification of an individual product model, the Representative Model shall be equivalent
- 343 to that which is intended to be marketed and labeled as ENERGY STAR.
- 344 ii. For certification of a Product Family, the highest energy using model within that Product
- 345 Family can be tested and serve as the Representative Model. Any subsequent testing failures
- 346 (e.g., as part of verification testing) of any model in the family will have implications for all
- 347 models in the family.

348 4.2.2 A single unit of each Representative Model shall be selected for testing.

349 **4.3 International Market Qualification**

350 4.3.1 Products shall be tested for qualification at the relevant input voltage/frequency combination for

351 each market in which they will be sold and promoted as ENERGY STAR.

352 **5 EFFECTIVE DATE**

353 5.1.1 Effective Date: The Version 1.0 ENERGY STAR Electric Vehicle Supply Equipment specification
354 shall take effect December 31, 2016. To qualify for ENERGY STAR, a product model shall meet
355 the ENERGY STAR specification in effect on the model's date of manufacture. The date of
356 manufacture is specific to each unit and is the date on which a unit is considered to be completely
357 assembled.

358 5.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
359 technological and/or market changes affect its usefulness to consumers, industry, or the
360 environment. In keeping with current policy, revisions to the specification are arrived at through
361 stakeholder discussions. In the event of a specification revision, please note that the ENERGY
362 STAR certification is not automatically granted for the life of a product model.

363 **6 CONSIDERATIONS FOR FUTURE REVISIONS**

364 6.1.1 EPA will continue to monitor the market for dc fast, dc slow, and wireless EVSE, and evaluate the
365 opportunity to differentiate such products based on energy performance. Should the potential for
366 significant energy savings exist among these products, EPA will consider expanding the scope of
367 this EVSE specification to include them in a future revision.

368 6.1.2 EPA will consider amending the test method for models with ABC enabled by default to require
369 illuminance conditions greater than 300 lux that would better represent typical outdoor conditions.