

Draft 1 ENERGY STAR EVSE Test Method Summary and Response

| Topic | Subtopic | Stakeholder Comment | Environmental Protection Agency (EPA) Response |
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| Definitions | Level 2 | One stakeholder noted that to harmonize with Society of Automotive Engineers (SAE) J1772 and not exclude any high-voltage but lower-current equipment, EPA should remove "greater than 16 amperes" from the Level 2 definition. | EPA has removed this language from the Level 2 definition to harmonize with SAE J1772. |
| Definitions | Operating Modes | One group of stakeholders commented that EPA should clarify the mode definitions by removing references to functions and function categories (primary, secondary, tertiary). Instead, EPA should harmonize with SAE J2894 mode definitions. | <p>EPA has provided footnotes referring to definitions in industry standards where appropriate, but has retained the previously proposed functions and function categories.</p> <p>EPA notes that any definition of a mode will be incomplete and that the mode will be fully specified only through the test setup and test conduct instructions in the body of the test method. Since these specific instructions will be different than those in other industry standards, EPA considers it less confusing to use the more general function categories rather than existing definitions.</p> |
| Definitions | Climate Conditioning | One group of stakeholders commented that EPA should add climate conditioning into the mode definitions. | Rather than listing additional primary functions that rely on the behavior of the connected electric vehicle, EPA has revised the primary function definition to state that the primary function of an EVSE is supplying current, regardless of how that current is used within the vehicle. |
| Definitions | Secondary Function | <p>One stakeholder commented that EPA should amend the definition of Secondary Function as follows:</p> <ul style="list-style-type: none"> - Remove "ambient lighting", as it does not enable or support the primary function, potentially moving it under Tertiary Function - Add safety functions, some of which support charging - Add pilot signal, which also supports charging | EPA has added safety functions and pilot signal as examples of secondary functions. |
| Definitions | Secondary Function | One stakeholder noted that the definition of Full Network Connectivity referenced displays rather than EVSE. | EPA has corrected this typographical error. |
| Efficiency Requirements (as reflected in the Test Boundary) | Level 1 | One stakeholder noted that the efficiency of charging with Level 1 EVSE may be lower than Level 2, even if the Level 1 EVSE is efficient in itself. This is due to lower efficiency of the car's battery charger at lower voltages and the longer duration of the charge, which increases the losses of ancillary loads such as air conditioning. One car model did not even include a Level 1 charger due to the magnitude of these losses. | EPA continues to propose that the test boundaries for the EVSE exclude the vehicle's on-board charger to only reflect the amount of power that the EVSE draws. However, EPA seeks additional feedback on the differences between the efficiency of the car's on-board chargers when supplied by Level 1 versus Level 2 EVSE. |

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| General | | <p>One group of stakeholders expressed support for an ENERGY STAR EVSE test method and specification.</p> <p>In contrast, another stakeholder does not support EPA developing a specification for a product that is newer to the market and is still growing. This stakeholder is concerned that government intervention will stifle the market and innovations for this product category prematurely. The stakeholder also expressed concern that the energy savings would be minimal, as EVSE products are already efficient in their active charging and relatively efficient in standby. As such, an ENERGY STAR program risks being sunset after a period of time and investment if additional savings are not possible in future revisions. Lastly, the stakeholder does not support ENERGY STAR addressing non-energy attributes.</p> | <p>EPA appreciates stakeholder support and engagement on the creation of a specification and test method for EVSE.</p> <p>In its initial market and engineering assessment, EPA identified savings opportunities for EVSE products, based on differences in power consumption among EVSE products when not actively charging, and present and anticipated growth in this product category over the past few years. The energy savings potential supports the development of an initial ENERGY STAR specification. As EVSE products continue to evolve their features and functionality, additional opportunities to maintain or improve energy efficiency are expected, ensuring longevity for this ENERGY STAR specification. The ENERGY STAR program is experienced in rewarding efficiency in products without hindering innovation as demonstrated by its success with many CE/IT product categories. EPA is interested in exploring how an ENERGY STAR EVSE specification can address connected functionality that could help optimize greater system-wide efficiencies and provide benefits to consumers. EPA is requesting feedback from stakeholders with this Draft 2 Test Method.</p> |
| Harmonization with Existing Standards | | <p>One stakeholder commented that while references to other external standards are helpful, EPA should define all terms (in particular, SAE J1772 states A, B, and C; switch modes S1/S2; measurement points L1, L2; and duty cycle) so the test method is clear.</p> | <p>EPA has clarified all terms required for testing and provided a cross-reference to definitions in other standards, where applicable. Also, EPA has retained several definitions that may not be currently used in the test method, but which may be used in the eventual specification based on the test method. As a reminder, the scope and definitions sections of the test method will move to the specification once that is released.</p> |
| Other Considerations | | <p>One stakeholder commented that EVSE should be able to support reverse power flow from the vehicle to the grid as long as the car's on-board inverter supports it. However, another group of stakeholders recommended that EPA remove such speculative features from the test method until products in the market support them.</p> | <p>EPA proposes to retain the option to account for reverse power flows in this test method, given rapidly changing EVSE technologies. Based on trends in vehicle electrification, EPA anticipates that such functionality may become more commonplace and thus seeks to develop a test method that can account for such functionalities when measuring power consumption.</p> |

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| Scope | Commercial | One stakeholder requested clarification whether commercial EVSE are included in scope, and if so, requested separate requirements for commercial versus consumer products, along with another stakeholder. | Commercial EVSE are in the scope of the specification and are meant to be included in the definition of a Level 2 charger. EPA would appreciate further feedback from stakeholders on EVSE intended for residential versus commercial use. Specifically, EPA is interested in learning if any features or functions significantly change the energy consumption of the EVSE if it used in a residential setting versus a commercial setting. |
| Scope | DC Fast Chargers | One group of stakeholders commented that while EPA should continue with Level 1 and Level 2 EVSE, the Agency should also track DC Fast Chargers for future consideration, due to their high power and ac-dc power conversion losses. | As the impacts of AC EVSE are expected to be greater, EPA will consider DC fast and slow chargers in future versions of the EVSE specification. |
| Scope | Vehicle Efficiency | One group of stakeholders commented that EPA should consider labeling entire vehicles, due to varying battery charging efficiency. | EPA already has a program that labels vehicles based on efficiency and this program includes labeling for electric vehicles and battery charging efficiency. At this time, the ENERGY STAR program is only including off-board charging in its Version 1.0 specification to highlight energy efficiency of EVSE. However, should an opportunity exist to deliver additional energy savings based on the interaction between the EVSE and the car battery, EPA may consider expanding its scope in the future, provided that other EPA vehicle labelling initiatives do not already incentivize such vehicle system-level efficiencies. |
| Scope | | One stakeholder commented that the scope section is not complete, and additionally requested that a purpose statement be added to the test method. | The scope clearly lists those products that are being proposed to be included in the scope and those that are excluded from scope for Version 1.0. The purpose of the test method is to provide a consistent methodology for testing EVSE in order to accurately compare products' energy consumption. The test method will accompany the forthcoming ENERGY STAR specification, which will be developed once the test method is further solidified. |
| Scope | Bi-level Chargers | One stakeholder noted that there are EVSE that support both Level 1 and Level 2 and requested that they be accommodated within the ENERGY STAR program, while another noted that input power instructions for these EVSE be simplified. | EPA has revised the scope to clarify that these products are included, and energy efficiency requirements for them will be developed in the forthcoming specification. The instructions for testing these models are included in the test method in Section 5.B.2. |

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| Scope | Couplers | One stakeholder noted that referencing the SAE J1772 coupler excludes some products that nonetheless support the SAE J1772 protocol and requested clarification that this was intentional. | EPA has removed the SAE J1772 coupler requirement from the scope such that the eventual specification can be applied to EVSE that ship without the coupler. As a result, EPA has included instructions in the Draft 2 test method that EVSE without a coupler be tested with an adapter, to be provided by the manufacturer, as the SAE J1772 physical interface is the industry standard. |
| Scope | DC Slow Chargers | One stakeholder noted that the scope allows DC Slow Chargers (<80 A dc) and requested a clarification. | EPA appreciates this feedback and has amended the scope to exclude all DC chargers. Although EPA understands that both slow and fast DC EVSE are available in the market, their total impact is smaller than that of AC EVSE. However, EPA will continue to monitor the market and may include them in a future revision to the test method. |
| Test Conduct | Automatic Brightness Control | One stakeholder requested clarification whether indicator LEDs subject to Automatic Brightness Control (ABC) shall be tested in dark room conditions. Conversely, the stakeholder inquired how LEDs would be tested if not subject to ABC, but controlled by an "Eco mode". | All products with ABC enabled by default, whether controlling display illuminance, indicator LEDs, or area lighting, shall be tested per the guidance in Section 6.1.C. This section has been amended to include a test under bright conditions in addition to the previously proposed dark conditions. Regarding other modes, the unit shall be tested as shipped. Therefore, if an "eco-mode" is enabled by default, the product shall be tested in eco-mode. Additionally, if the product does not have ABC functionality or ABC is not enabled in the default as-shipped condition, the UUT does not need to be tested under the two brightness conditions. |
| Test Conduct | UUT Mounting | One stakeholder commented that UUT should be mounted per the manufacturers' instructions with reference to a "vertical surface or structure". | EPA has clarified the set-up instructions to state that the UUT shall be tested per the manufacturer's installation instructions, and if no manufacturer instructions are provided, then to test the UUT on a thermally non-conductive surface. |
| Test Procedures | Connected Functionality Testing | One stakeholder commented that EPA should not reference a particular protocol for Smart-grid Connectivity, but rather set performance goals that multiple protocols can meet. Another group of stakeholders stressed the importance of testing and certifying response to both events and price signals, and recommended that EPA refer to Title 24 California Building Efficiency Standards Joint Appendix 5 and the related International Green Construction Code (IgCC). | EPA continues to include a placeholder for connected EVSE test methodology and plans to propose ENERGY STAR EVSE Connected Functionality criteria in the specification, prior to developing the test methodology. |

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| Test Procedures | Ground Current | One stakeholder commented that measurement of ground current be removed throughout the test method, as this is a safety test already performed elsewhere. | EPA has removed the language requiring measurement and recording of ground current. However, it is still important to note that all required industry safety tests should be performed prior to ENERGY STAR testing. |
| Test Procedures | Control Pilot Signal | Two stakeholders commented that measurement of the pilot signal be removed throughout the test method as the EVSE should supply whatever current is required by the load up to its rating. Measuring the pilot is an unnecessary burden. | EPA has removed the requirement to record the control pilot signal properties (voltage, frequency, and duty cycle. The control pilot shall still be measured to calculate the load current for the Operation Mode test. |
| Test Procedures | Operation Mode Testing: Maximum Load | One stakeholder requested that an additional high-current measurement at 40 A be added to the Loading Conditions table. | EPA has adjusted the example loading conditions in Table 4 to reflect higher nameplate current models. |
| Test Procedures | Operation Mode Testing: Minimum Load | Two stakeholders requested that the low-current measurement of 2 A in the Loading Conditions table be increased to 6–8 A, with input from vehicle manufacturers, as lower currents are not practical and may not be supported by SAE J1772. | EPA has changed the fourth loading condition in Table 4 to 4 A to capture the low current AC power draw. This change better reflects continuing power draw to condition battery temperature after charging is complete. |
| Test Procedures | Operation Mode Testing: Accuracy | One stakeholder commented that measurement accuracy requirements should be deleted from the Operation Mode Testing section since they are already specified in the Test Setup. | EPA has removed the measurement accuracy requirements in the Operation Mode Testing section since they are redundant. |
| Test Procedures | Operation Mode Testing: Power Factor | One stakeholder commented that power factor will be close to unity in Operation Mode and need not be measured in this mode. | EPA has removed the power factor measurement from the test method, as power factor is expected to be close to unity in On Mode, while even a low Power Factor in Partial On Mode is unlikely to have a large impact on losses due to low power levels. |
| Test Procedures | Operation Mode Testing | A stakeholder recommended that a requirement be set to report average power loss in addition to percent efficiency as both values may be necessary to inform the ENERGY STAR specification development process. | EPA will collect the power loss in addition to the percent efficiency per stakeholder feedback that it could inform the specification development process. Whether the power would be an average or an instantaneous value will depend on the conditions. |
| Test Procedures | Power Down Time | A stakeholder commented that the test method should be revised to address the amount of time required to transition from higher power modes to low power modes by requiring a power-down time limit. | EPA added an auto power down (APD) test. |

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| Test Procedures | Partial On Mode and Idle Mode Testing: Full Network Connectivity | A stakeholder suggested that EPA develop a standard protocol to address two-way communication for testing networked EVSE as well as measuring power without communication features enabled. | The draft test method already includes a full network connectivity test in Partial On Mode. |
| Test Procedures | Partial On Mode and Idle Mode Testing: Timer Functions | A stakeholder noted that demand response and timer functions may be inherent to a model and thus the language should be changed from requiring that these functions be disabled to state that these functions should be set to avoid altering power delivery during testing. | EPA added language to account for models with demand response and timer functions that cannot be disabled. |
| Test Setup | Power Meter | A stakeholder recommended that EPA delete instructions for degaussing a power meter since a qualified lab will not need instruction. | EPA has removed the instructions for degaussing a power meter per stakeholder feedback. |
| Test Procedures | Partial On Mode and Idle Mode Testing | A stakeholder commented that there should be additional instructions for measuring standby power, such as accumulating energy over a period of time and reporting average power, to capture cyclical behaviors during Partial On Mode. | EPA has included a reference to IEC 62301, which outlines how to measure standby power over a period of time. |
| Test Setup | Cables | <p>A stakeholder recommended that EVSE should be tested in the hardwired configuration if available and the cable be set to 1 foot for consistency. While another noted that cables of the same gauge may support different currents depending on insulation and wire type (per Table 310(B)(16) of the NFPA 70® 2014 National Electrical Code) and recommended further specifying the cable type such that a consistent gauge is used for a particular rated current.</p> <p>One of the stakeholders noted that all power cables should be the default provided by the manufacturer. While another recommended using the longest (and potentially lowest-diameter) sold with the EVSE to capture worst-case performance.</p> | To avoid confusion over conductor type and provide the most repeatable results, EPA has revised the test setup instructions to require measurements directly at the input power connection (e.g., screw terminals) inside the EVSE for products that do not ship with an input power cord. This will also reduce testing variability and be more representative of typical installations. |
| Test Setup | Default Settings | A stakeholder recommended that factory presets be recorded prior to testing and adjusted if needed to achieve a specified screen illumination level for EVSE with screens. | To ensure a representative test, EPA proposes to require testing display brightness and other features, as shipped, if practical. This also allows for a less burdensome test than recording the presets and adjusting them to a configuration particular to the test. |

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| Test Setup | Input Power Measurement Apparatus | A stakeholder noted that a detailed description of the power measurement apparatus should be added. Another stakeholder stated that a specific plug and cord should not be required for the test apparatus since that will not ensure repeatability and safety since not all equipment is plug and cord connected. This stakeholder also noted that the addition of a plug/receptacle interface adds significant power loss if tested at full power, although it is insignificant in standby mode. | EPA has revised the test method to focus on the capabilities of the device and the measurement rather than its specific construction. |
| Test Setup | Input Supply Requirements | A stakeholder recommended that the input voltage tolerance be changed to + 10% to align with most utility voltage requirements. Another stakeholder suggested that Table 1 (Input Supply Voltage) be removed and the UUT be tested at its highest rated voltage. | EPA proposes to retain the tighter voltage tolerances in Draft 2 to ensure repeatability of power measurements. |
| Verification | | A stakeholder requested that an annex be added to ensure that energy usage is measured in several different labs periodically to ensure consistency. | Per EPA's third party certification program, all EPA-approved labs will need to be accredited to perform the EVSE testing. As such, all testing labs should be set up to yield repeatable results and capture accurate test data, such that it is not necessary to test EVSE in different labs. |