**EVF-23.6 V S.5.2. EVSE Identification and Marking Requirements and T.2. Tolerances**

**Source: Florida Department of Agriculture and Consumer Services, Electrify America, Tesla, EVGo, and Siemens**

**Submitter’s Purpose and Justification:**

The revised proposal would amend Handbook 44, Section 3.40. Tentative Code in the following ways:

1. Paragraph T.2.1. would be revised for DC chargers. The 1 % (acceptance) / 2 % (maintenance) tolerances would apply to devices installed after January 1, 2024. For devices installed before that date, the tolerances would be 5 % (acceptance and maintenance).
2. For the sake of clarity and transparency for customers and inspectors, a device subject to the 5 % tolerance would have to be marked as such. The proposal would require specific language for the marking.
3. If a manufacturer has achieved 1 % capable chargers earlier than the January 2024 timeframe, users of those chargers might prefer not to mark the chargers as 5% chargers; and then those chargers would be subject to the 1 %/2 % tolerance. The proposal includes language to establish this treatment.

The 5 % tolerance for pre-2024 chargers would end on January 1, 2034. After that date, all DC chargers would be subject to the 1 % (acceptance) / 2 % (maintenance) tolerance.

**A. The effect of the proposed revisions**

The changes we propose would work as follows: all DC chargers would remain exempt from the accuracy tolerances until January 1, 2028, as NCWM adopted at the 2022 Annual Meeting. When accuracy tolerances come into force, a DC charger installed after January 1, 2024, would have to satisfy the 1 % (acceptance) / 2 % (maintenance) tolerance, the same levels as for AC chargers. But a DC charger installed before January 1, 2024, would have to meet only a 5 % accuracy tolerance. That 5 % accuracy tolerance would expire on January 1, 2034, at which point all the legacy chargers will have to have been retrofitted or replaced.

The proposal would require a charger that is subject to the 5 % tolerance to display a marking, with specified language, informing customers and inspectors of that fact. But the proposal leaves open the possibility that a given manufacturer might achieve the 1 % / 2 % tolerance earlier, and then would specify that capability for a given model. Devices in that model would not have to be marked as 5 % devices; but if they are not marked that way, they would of course be subject to the 1 % / 2 % level as for new chargers.

**B. The basic justification**

DC and AC chargers are fundamentally different—in technology, in customer use, and in metering capabilities. AC charging technology, the older form, delivers energy in the same form—voltages and currents oscillating at 60 Hertz (in the United States) as utilities have provided it for a century. Because a vehicle has to convert AC energy to DC for charging the battery, AC charging stations operate at no more than 19.7 kW, and most no more than 6-7 kW. These charging rates will add 24-80 miles of range in an hour of charging a typical car, and consequently AC charging involves extended sessions—the median time that a customer uses an AC station is 22 hours.0F[[1]](#footnote-1) The voltages delivered are no more than 480 volts ac, and the current is no more than 50 amps ac (and more typically 30 amps ac). By contrast, DC chargers deliver energy in the same form that a battery ultimate needs it. Using voltages of 400 to 950 volts dc and currents up to 500 amps dc (higher levels are coming in the future for applications like charging heavy trucks), they are able to deliver 50kW, 150 kW, 350 kW, or higher charging rates. These stations will add 200-1400 miles of range in an hour of charging, or, more meaningfully, 400 miles of range in as little as 20 minutes. A customer at a DC station will arrive, charge briefly, and then depart. Customers incorporate AC chargers into their regular routines, such as by driving to work and charging there. DC chargers are more commonly used to support long-distance trips.1F[[2]](#footnote-2)

For AC charging, manufacturers have been able to utilize metering technology that has been developed over a century for electric utilities. When Handbook 44, section 3.40 was developed in 2015, that AC metering technology was well understood. There have been long-established standards for AC revenue meters—though those standards, in the utility sector, are not necessarily the same in every respect as how a weights and measures standard would work. One indication of the relatively mature state of AC metering is that NIST has long provided ordinary-course calibration services for AC watt-hour meters that operate at 60 Hertz, within ranges of 69 to 480 volts and 0.5 to 30 amps (sufficient to cover typical AC chargers).2F[[3]](#footnote-3) DC metering technology, by contrast, has been “in research and development.”3F[[4]](#footnote-4) When section 3.40 was adopted, the accuracy tolerances of 1.0 % (acceptance) and 2.0 % (maintenance) were predictive and aspirational for DC chargers. As of November 2019, when California adopted its own regulation based on section 3.40, meters and chargers meeting that standard were not yet generally commercially available.4F[[5]](#footnote-5) Meanwhile, NIST calibration services for DC watt-hour meters are non-standard, and are available only up to 240 volts and 5 amps5F[[6]](#footnote-6)—far below the levels needed for testing DC chargers.

Argonne National Lab has studied the availability of DC metering technology. Our understanding is that its draft report (not yet finalized, so far as we are aware) concludes that there are now on the market (at least in principle) meters for use in DC chargers that can meet a 1 % acceptance / 2 % maintenance tolerance. It is reasonable to conclude that the 1 % / 2% tolerance will be achievable in general. The current proposal is focused on how to handle the chargers that are installed before that point. Previously installed chargers will not in general be able to satisfy a 1 % / 2 % accuracy tolerance. To be clear, we do not suggest that every existing charger would be more than 2 % inaccurate. Indeed, it would not genuinely be possible to make that assessment, given the lack of NIST-traceable measurement apparatus to test fast DC chargers in the field.

There is presumably a distribution of potential deviations among devices in the field. Given what metering technology has been commercially available, a 2 % maintenance accuracy would lead to inspection problems for a high proportion of devices.

The proposal would establish a tolerance of 5 % for devices installed before January 1, 2024. The justification for this particular choice of tolerance and timeline is as follows:

1. In 2019, California adopted a regulation that put a modified version of Section 3.40. into force for new devices. DC chargers installed before January 2023 are subject to no weights and measures standards at all until 2033. DC chargers installed after January 2023 (and before January 2033) are subject to a maintenance tolerance of 5.0 % (and acceptance tolerance of 2.5 %). Consequently, in California, which represents roughly 30 % of the currently-existing base of DC chargers, the maintenance tolerance will be 5.0 % for the coming decade. A maintenance tolerance of 5.0 % for legacy chargers in section 3.40 will be stricter overall than the California regulation (because it will apply to all legacy chargers, whereas the California standard applies only to post-2023 chargers) but will align with the numerical tolerance used in California. Although a 5.0 % tolerance is among the larger tolerances used in Handbook 44, it is not unprecedented. And the fact that new chargers in California will be subject to that standard will mean EV charging customers have substantial experience with that chargers at that tolerance, and the 5.0 % tolerance we propose would be the same transactional experience as customers in California (the largest EV charging market in the country) receive. It bears mention, too, that as Measurement Canada prepares to implement standards for AC chargers, the tolerance (acceptance and maintenance) will be 3.0%, not the 1 % acceptance in Handbook 44. The cost of a typical charging session is $15 to $20. A 5.0% maintenance standard would mean a variation, beyond that, of an additional plus *or minus* 40 cents. As with any tolerance, that variation could at any given charger be for or against either side to the transaction.
2. The industry submitters have studied carefully their existing chargers, measurement devices and existing models now available. They believe the 5 % maintenance tolerance is achievable at a manageable cost in the future, because it will generally not require extensive reconfiguring of cabinets and the installation of four-wire cables.
3. The cost of bringing legacy chargers into line with the 1 % / 2 % standard would be extreme. Although equipment is not available to test DC fast chargers in the field, some operators have found in tests of existing devices that they can be brought to a 5 % tolerance but cannot meet the 1 % / 2 % standard without replacing the meters or implementing an entirely new measurement system, which means a physical reconfiguration at each station and/or replacing the cables for delivering the energy to vehicles. Section 3.40. standards are based on the energy delivered at the connector to the car; in other words, a charger must account for losses in the cables. The most straightforward way to account for losses is to measure the voltage at the vehicle connector; that means the cable must have two additional high-voltage leads, to carry that voltage back to the meter6F[[7]](#footnote-7). In California’s Initial Statement of Reasons (ISOR) for adopting specifications and tolerances requirement for commercial EVSE, California estimated that it costs approximately $20,000 to retrofit an existing DC charger.7F[[8]](#footnote-8) We understand that cost to represent the cost (parts and labor) to replace the charging cable, and possibly to replace the meter if that task is simple. This cost may be a significant underestimate for some models of charger, because replacing the meter may not always be possible without physical reconfiguration of the space within the charger. Which charger models would require that sort of reconfiguration, and what proportion of the installed base they represent, is impossible to know without a detailed model-by-model study and detailed model-by-model installation data across manufacturers. The upper end of cost would be simply the cost of replacing a charger, which many operators would find preferable to physical reconfiguration of charger internals anyway. The International Council on Clean Transportation (“ICCT”) reported in 2019 that fast DC chargers cost between $75,000 and $140,000 per charger, for the charger itself.8F[[9]](#footnote-9) Installation costs range from $18,000 per charger (for six 150 kW chargers at a site) to $65,000 per charger (for one 350 kW charger at a site).9F[[10]](#footnote-10) The total cost (installation and equipment) for a 4-charger site would be roughly $720,000. That said, some amount of the installation cost represents upgrades to electrical supply lines and basic site construction, costs that would not be incurred anew to replace equipment. So, for a rough estimate, it is appropriate to use the lowest cost estimate from the ICCT, which is $17,692 (the cost per charger for a large site of 50 kW chargers). With that figure, replacing a 4-charger site of 350 kW chargers would cost roughly $630,000, or $157,000 per charger.
4. Based on data on the existing charge base from the National Renewable Energy Laboratory’s Alternative Fuels Data Center (“AFDC”), we can assume there will be about 36,000 “pre-2024” DC chargers.10F[[11]](#footnote-11) These are only a fraction of the overall chargers that will be installed nationwide over the coming decade but bringing them into compliance with a 1 % / 2% tolerance will be highly costly. Taking out the 30 % that are in California (which already has regulations with a 5.0 % maintenance tolerance, for all post-2023 DC chargers), retrofitting all of those at the $20,000 cost would total $720 million. If meter replacement is not possible and those chargers must all be replaced, the total would be $5.6 billion. The actual cost of bringing the pre-2024 chargers to compliance with a 2.0 % maintenance tolerance would be somewhere between these numbers.11F[[12]](#footnote-12)
5. The January 2024 date moves faster than the California regulation. Under the California regulation, the 1 % / 2 % tolerance would not come into force until 2033. It appears that meters capable of that tolerance are now available on the market. The submitters propose January 2024 as the date for distinguishing “legacy” from “new” chargers, because the existence of these meters on the market is not all that is needed. Manufacturers have to access the meters, design products incorporating them; revise production lines; test the new products to ensure they are safe and reliable; and obtain third-party certifications (such as from Underwriters Laboratory) of the revised products. After those steps, a manufacturer can begin delivering a revised product to operators. Installation of a charger is not simply a matter of placing it on a counter; charging sites involve construction work, leading to the secure attachment of a charger to a specially built concrete pad. In other words, from the first delivery of a new model of charger to the first installations of those chargers also takes time. The January 2024 date is appropriate for expecting new chargers to incorporate meters that were available a few years before that date.
6. The proposal focuses on installation before January 2024, rather than using the concept of retroactive/non-retroactive that is more common in Handbook 44, because non-retroactive is ordinarily based on when a device is placed in service. Many states do not yet regulate EV chargers and consequently have no placed-in-service process. In these states, “placed in service” would not be a well-defined concept, and regulators might not have good ways to determine when a device was placed in service. Installation is a reasonably well-defined process, and it should be possible to identify when a given charger was installed. California’s regulation has differing status for pre-2023 and post-2023 chargers, and it bases that line on installation.
7. The proposal also specifies 5.0 % as the acceptance tolerance, not just the maintenance tolerance. As a practical matter in field inspections, the acceptance tolerance for pre-2024 chargers will not be important. Section 3.40 (as amended at the 2022 NCWM meeting) exempts DC chargers from the accuracy tolerance until 2028. When they become subject to accuracy tolerances, no pre-2024 charger will be at the point of acceptance. The proposal specifies an acceptance tolerance for clarity in type evaluations, which ordinarily evaluate device models against the applicable acceptance tolerance.
8. The exemption until 2028 adopted at the 2022 meeting does not eliminate the need for this proposal. When DC chargers are subject to accuracy tolerance requirements, pre-2024 chargers will still need to meet the applicable tolerance or be retrofitted or replaced. The 2028 timeframe is unreasonably soon to do that, given the cost estimates above. California estimated that chargers have an effective 10-year lifespan.12F[[13]](#footnote-13)  This estimate is highly uncertain, in part because it was based in part on older AC chargers. Newer DC chargers, using more advanced technology for significantly more expensive equipment, are likely to have usable lifetimes greater than 10 years. The proposal recognizes that, nonetheless, there is a tradeoff between the cost of retrofitting or replacing devices, and the value of tighter tolerances. Some number of chargers will fail and need replacement earlier than 10 years, thus reducing the number that eventually need to be retrofitted or replaced to comply with tighter accuracy tolerances. Overall, the proposal uses the same 10-year period that several states have already adopted.13F[[14]](#footnote-14)  Notably, the effect is significantly more stringent than in the California regulation. Under California’s rule, a charger installed before 2023 is subject to no standards for 10 years, and then becomes subject to standards in 2033; a replacement of the charger in 2032 would be subject to the 5.0 % maintenance tolerance. A charger installed in 2023 (and that hypothetical 2032 installation) would be subject to the 5.0 % tolerance indefinitely, with no end point. Our proposal, by contrast, would make a pre-2024 charger subject to the 5.0% tolerance once the 2028 compliance dates kicks in but only until 2034, at which point the charger would have to be retrofitted, replaced, or otherwise brought to the 1 % / 2% tolerance.

**C. Potential objections**

In response to the industry’s original proposal, some people commented that AC and DC chargers should be treated the same. As explained above, they are not the same, not only because of technology differences but also because customers use them and view them differently. California and NTEP have distinguished AC and DC chargers since at least 2021, and NCWM has already recognized important differences between them, in Handbook 44.

Some have also commented that there should not be parallel accuracy classes for a given application. But this approach is not unprecedented. In 1986, NCWM required new scales to be marked with an accuracy class. Pre-1986 scales could remain unmarked, and those unmarked scales were subject to various accuracy tolerances (depending on application) that ranged up to 5.0 %, compared to the largest tolerance for any marked scale at 2.0 %. For grain moisture meters, Handbook 44 has completely separate sections for pre-1998 and post-1998 devices, with some different tolerance specifications for older and newer devices. For both scales and grain moisture meters, there was no sunset date; the older devices have been allowed to continue in use for as long as they operated. We do not suggest that the circumstances with EV chargers are the same. Each of those past examples was based on justifications particular to that situation. Nonetheless, these examples show that it has been done to maintain parallel tolerances for a given application. In addition, there are already parallel, differing tolerances for EV chargers. If the proposal is not adopted, pre-2023 chargers in California will have no tolerance at all until 2033; post-2023 chargers will have a 5.0% maintenance tolerance for the indefinite future; and chargers elsewhere in the country, including in states neighboring California, will have the existing Handbook 44 tolerances. The proposal shifts the line between differing tolerances, but the situation of differing tolerances for the same application is already in place without the proposal.

There have been claims that some manufacturers may be able to achieve 1 % devices (DC chargers) before January 2024, and one or more may already have done so. Even so, the proposal is still warranted. Operators of EV chargers should not be forced to replace their existing chargers simply because they could not get access to chargers made by a given manufacturer. It is generally agreed that when section 3.40 was adopted, the equipment to satisfy it did not exist for DC chargers. Reaching that point has required research and development by meter manufacturers and charger manufacturers. The goal of regulation should be to handle the technology transition in a reasonable, fair manner, without prejudice to operators that have made diligent efforts in procurement and operation of their chargers.

This proposal arrives without the formal approval of the U.S. National Work Group subgroup on EV charging. But a similar proposal did have general consensus at the Work Group. NIST personnel solicited views on the proposal through an email ballot at the end of June 2022. The resulting votes were 11 in favor, and 1 opposed. As of this filing, NIST has not provided information on whether this vote was sufficient for the subgroup to formally endorse the proposal. The one-person voting “no” said that the person would have voted yes if the proposal included a 10-year end date for the 5% tolerance. The current proposal has that feature and thus addresses the only concern expressed by the sole “no” vote. The current proposal has that feature and thus addresses the only concern expressed by the sole “no” vote.

| 18B**NIST OWM Executive Summary for EVF-23.6 – S.5.2. EVSE Identification and Marking Requirements and T.2. Tolerances** |
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| * Initially NIST OWM suggested Items EVF-23.5 and EVF-23.6 both propose changes to marking and accuracy requirements in NIST Handbook 44.
* OWM has given thought to how we might assist the Committee and the Community in addressing these items and arriving at a single proposal that would meet the needs of the submitters of both items and other stakeholders.
* OWM believes this proposal (Item EVF-23.6) and the alternative recommended in Item EVF‑ 23.5 both required more work and vetting as suggested by two of the four regional associations. Voting Item EVF-23.6 needs further refinement.
* OWM believes this *preliminary* work would have been done in the USNWG SG as recommended during the WWMA meeting and recommended the Committee designate these items as Developing in 2023 and asked the SG for assistance in vetting the proposals. Adoption should occur only after fully vetting proposals by the entire community as the submitter(s) may be too close to the subject or take too wide a berth in the development of new or modification of existing requirements resulting in either overlooking or oversimplifying the lessons learned in the marketplace which can lead to misreading the complexities of commercial applications which have necessitated legal metrology controls. It has been reported that when addressing the level of confidence that buyers and sellers have, and the accuracy with which these transactions are performed that: The consumer has no way to verify the accuracy of the transaction and must rely on the accuracy of the fuel dispenser.
* In anticipation that the Committee believed there was an urgent need to move one of these proposals forward, OWM encouraged the Committee to use the proposed language in Item EVF-23.5 as a starting point to ensure clarity and understanding of the final language.
* Having well-defined tolerances with clear and understandable effective dates is essential.
* Defining tolerances that are enforceable in the specific device codes is also preferable to the alternative of having jurisdictions use the provisions of the General Code to implement tolerances suitable for the application since this has the potential for non-uniform application across the country.
* As shared in its comments in Item EVF-23.5, OWM believes the proposed changes in Item EVF-23.5 was much clearer in language, format, and application and are closer to language agreed to by the USNWG SG for ballot in June 2022 than are the proposed changes in Item EVF-23.6. OWM is aware of the Committee’s decision to withdraw Item EVF-23.5.
* The USNWG EVFE Subgroup gained momentum as the result of a June 2022 ballot in which the group agreed to move forward to recommend a wider tolerance of 5 percent only for DC systems installed before 2024 that must bear accuracy markings while maintaining for AC systems a 1 percent Acceptance Tolerance/2 percent Maintenance Tolerance and the tighter tolerance would also apply to post 2024 DC systems.
* The language from the June 2022 ballot is included in OWM’s detailed analysis below and in Item EVF-23.5.
* As noted in its comments on Item EVF-23.5, OWM is aware of comments indicating EVF-23.5 may not meet the needs of all stakeholders as presently written and OWM believes additional changes would have been needed to that item. However, the proposed changes in Item EVF-23.5 are much clearer in language, format, and application and are closer to language previously agreed to by the USNWG SG in June 2022 than are the proposed changes in Item EVF-23.6.
* It also is written that the components of the weights and measures infrastructure help to ensure the accuracy and validity of commercial transactions based upon weight, measure, or count and to ensure that the quality of products meets required quality standards. Another purpose of these components is to ensure consumers are informed so that they can make value comparisons. A robust infrastructure ensures equity in the marketplace, meaning that consumers receive the correct quantity and quality of products and services for which they pay, and businesses receive fair payment for the products and services that they deliver. By ensuring that they operate according to a consistent set of weights and measures standards and practices, businesses are also protected from unfair competition.
* Regarding 2023 work on Item EVF-23.6, OWM offers the following updates on its specific technical concerns as a result of the Committee’s work January through March 2023 to modify the proposal to address these points:
* OWM had questioned the reference to certification in the phrase “certified to the tolerances of T.2.2.(b)” which was initially proposed in Item EVF-23.6 for new paragraph S.2.5.1. Marking as a condition for the proposed new marking statement.
* If the intent is to note the marking is not required for devices capable of meeting the 1 % Acceptance and 2% Maintenance tolerance, then the language should have clearly stated this.
* This statement also implied testing to determine compliance to 1 % Acceptance and 2 % maintenance tolerance has occurred for DC systems which is contradictory with the language included in paragraph T.2. in July 2022 which exempted DC systems from the tolerances until January 1, 2028.
* OWM concurs that the markings need to be “conspicuously and legibly displayed.” Prior versions of similar language considered by the EVFE Subgroup also included the term “indelible” in recognition that the General Code requires all markings to be of a permanent nature. OWM concurs with the Committee on it including the term “permanent” to align with the language used in the General Code.
* Proposed accuracy markings need to be separate from the markings of electrical energy levels and required temperature ranges, therefore OWM concurs with the “Notice” being included as a separate, new subparagraph S.5.2.1.
* Below are some additional comments for the Committee and other stakeholders to have considered in their review of Item EVF-23.6:
* Use of the terms “load” and “accuracy” should be reviewed for consistency in their use in the titles of the two T.2. subparagraphs.
* Should the community revisit the proposal to consider July input for recognizing proposed new accuracy marking information in a digital format, then NIST OWM suggests a review of past national discussions on the electronic formatting of required marking information and also consider April 2023 comments raised in the EVFE Subgroup ballot for specifying a minimum time for the duration of the displayed accuracy statement and the statement be capable of being viewed in entirety prior to use of the EVSE.
* Adoption should occur only after fully vetting proposals to modify fundamental requirements such as those that impact accuracy, transparency, or that ensure fair competition to:
* avoid unforeseen consequences;
* ensure stakeholders have the tools needed for this new device application;
* discourage nonuniformity which can have a disruptive influence on the marketplace; and
* take corrective action on discovering any gaps/oversight in modifications to the seven-year-old legal metrology requirements.
* Where commercial equipment is known to operate at dual tolerances the proposed marking and performance requirements should be retroactive. Although there is likely to be some discussion as to what nonweights and measures agencies designate as a “public” station; the DOE EERE Alternative Fuels Data Center provides the number and location (stations/ports/charging levels) of alternative fueling installations in each state on the EERE website available at: [**https://afdc.energy.gov/stations/states**](https://afdc.energy.gov/stations/states).
* NIST OWM acknowledges that the EVFE Subgroup met on December 8, 2022 and March 2 and 6, 2023 to address proposals under consideration for the 2023 standards development cycle and the SG provided a July 12, 2023 memorandum on its position in support of the Item Under Consideration for Item EVF-23.6 as it appears in the Committee’s Interim Meeting Report (PUB 16).
* NIST OWM encourages the community's participation in the USNWG EVFE Subgroup which began its work in 2012 and whose work resulted in NIST HB 44 3.40 EVFS Code's adoption in 2015. The Subgroup has reviewed the four paragraphs that appear in multiple 2023 proposals that address: (1) dual EVSE tolerances (2.0 percent or 5.0 percent [DC EVSEs]); (2) new EVSE markings required for the wider tolerance in the marketplace; and (3) corresponding accuracy test procedures.
* There are several dates referenced in proposed EVF-23.6 paragraph T.2.2. Tolerances that conflict and OWM believes will create confusion for those implementing the proposed requirements.
* The statement adopted by the NCWM in July 2022 exempting DC devices from any tolerance requirements until 2028 remains in the proposal, yet there is a date of 2024 in both the proposed paragraph T.2.2.(a) and paragraph T.2.2.(b) which specifies requirements for DC devices installed prior to 2024. This is confusing and widens the gap: (1) in time delays in the application of tolerances in what will be a dual tolerance marketplace for DC systems (2) that encourages nonuniformity in equipment performance and (3) in the timely marking of information for consumer awareness.
* Proposed paragraph T.2.2.(a) references a sunset date of 2034, yet there is still a statement referring to a 2028 date, creating a conflict. Additionally, the 2034 date is 6 years after the 2028 date that was adopted by the NCWM in July 2022. The rationale for establishing a sunset date of 2034 for the entire country, given the pace at which technology has already advanced, is nineteen years after the tentative code was first adopted by the NCWM.
* There were differences between the language recommended in that June 2022 SG ballot and that proposed in Item EVF-23.6. The language recommended in the June 2022 ballot:
* Permitted DC devices installed before 2024 to have a wider tolerance if they were clearly marked to designate their accuracy.
* Included a wider tolerance of 5 % for DC systems installed before 2024 when accuracy is marked, which several OEMs identified as achievable. Note: The June 2022 SG’s language did not include an exemption for DC systems from accuracy tolerances up through 2028 to sunset in 2034 and was a more suitable option.
* Recognized the EVFE Subgroup would further refine the requirement’s text.
* OWM acknowledged a Florida, Electrify America, Tesla, EVGo, and Siemens’ October 15, 2022, letter sent to the S&T Committee regarding EVF-23.6 and a June balloted proposal of the USNWG EVFE Subgroup (SG). OWM submitted the following clarifications regarding this letter to the S&T Committee.
* NIST OWM, as convenors of the EVFE SG, sent a response to the Committee indicating that although the results of the Subgroup’s June 2022 ballot indicate the group’s support for modifications to tolerances and marking requirements this should not be construed as supporting the specific changes proposed in EVF-23.6.
* There are some key differences between the Subgroup’s June balloted proposal and EVF-23.6. Specifically, the Subgroup’s proposal does not include two different retroactive dates and differs in the magnitude of the tolerances and specific conditions under which they would apply, the permissible format required for markings (which are not indelible, do the submitters have a label or electronic only in mind?) and reference to certification. The convenors of the Subgroup will continue to provide written and verbal input as explicitly directed by the group.
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**Table 2. Summary of Recommendations**

**EVF-23.6 – S.5.2. EVSE Identification and Marking Requirements and T.2. Tolerances**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Status Recommendation** | **Note\*** | **Comments** |
| Submitter | Voting |  | October 15, 2022 and May 8, 2023 letters of support |
| OWM | Informational |  | October 20, 2022 letter of clarification on points made in the Submitter’s 15OCT2023 letter to the Committee and on the June and December 2022 dissimilar findings of the USNWG EVFE Subgroup. With all handbook modifications employ safeguards that adhere to sound weights and measures principles in the same fashion as other refueling and new device applications. |
| WWMA  | Developing |  |  |
| NEWMA | Voting | 1 | Recommended a 2028 effective date for only proposed paragraph T.2.2. DC tolerances. |
| SWMA  | Voting |  |  |
| CWMA  | Voting | 1 | Propose further modification of paragraph S.2.5.1. to recognize the use of the indications to display the accuracy markings statement. |
| NCWM | Voting |  |  |
|  | **Number of Support Letters** | **Number of Opposition Letters** | **Comments** |
| Industry | 2 |  | July 12, 2023 letter from four companies and a second letter from a single company support EVF-23.6 with one change, noting their share and differing roles in the EVSE market. The change to EVF-23.6 would include proposed new paragraph S.5.2.1. to also recognize a digital accuracy notice statement.  |
| Manufacturers |  |  |  |
| Retailers and Consumers |  |  |  |
| Trade Association |  |  |  |
| USNWG EVFE SG | 1 |  | July 12, 2023 memorandum summarizing ballot results where 6 Public Sector and 7 Private Sector members of the Subgroup voted resulting in 12 approvals and 1 (Private Sector) vote in opposition to the Committee’s draft proposal. Voting results including all comments were made available May 5, 2023. Voting guidelines required 12 votes of approval from the 23 voting members on the subgroup roster. An April 2023 EVFE SG ballot to recognize a digital accuracy statement was not approved by the EVFE SG.  |

**\*Notes Key:**

1. Submitted modified language
2. Item not discussed
3. No meeting held
4. Not submitted on agenda
5. No recommendation or not considered

**Item Under Consideration:**

Amend Handbook 44, Electric Vehicle Fueling Systems as follows:

**S.5.2. EVSE Identification and Marking Requirements**. – In addition to all the marking requirements of Section 1.10. General Code, paragraph G-S.1. Identification, each EVSE shall have the following information conspicuously, legibly, and **~~indelibly~~** **permanently** marked:

1. voltage rating;
2. maximum current deliverable;
3. type of current (AC or DC or, if capable of both, both shall be listed);
4. minimum measured quantity (MMQ); and
5. temperature limits, if narrower than and within – 40 °C to + 85 °C (40 °F to + 185 °F).

**S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024. - A DC EVSE installed and placed into service prior to 2024 shall be marked with the following:**

**NOTICE:**

**“This charger operates at a tolerance of up to ± 5 percent versus other chargers which operate at a maximum tolerance of up to ± 2 percent.”**

**This marking shall be conspicuously and legibly displayed in a position plainly visible to a person accessing a charging port of the EVSE.**

**This marking requirement does not apply to DC EVSEs that are capable of meeting an acceptance tolerance of ± 1 percent and a maintenance tolerance of ± 2 percent.**

**(Added 202X)**

**T.2. Test Tolerances**

**T.2.1. EVSE ~~Load~~** **Accuracy Test Tolerances for** **AC Systems**. – The tolerances for EVSE load tests **for AC systems** are:

1. Acceptance Tolerance: 1.0 %; and
2. Maintenance Tolerance: 2.0 %.

**T.2.2. EVSE Load Accuracy Test Tolerances for DC Systems. -- The tolerances for EVSE load tests on DC systems shall be as follows:**

1. **For DC systems installed and placed in service prior to January 1, 2024, and that bear the notice specified in paragraph S.5.2.1. Marking of Accuracy Limits, DC EVSEs installed and placed in service prior to 2024, acceptance and maintenance tolerances are: 5.0 percent. This paragraph T.2.2(a) shall expire on January 1, 2034; after that date, all DC EVSEs shall be subject to the tolerances of paragraph T.2.2(b).**
2. **For DC systems installed and placed in service on or after January 1, 2024, or that do not bear the notice specified in paragraph S.5.2.1. Marking of Accuracy Limits, DC EVSEs installed and placed in service prior to 2024 tolerances are:**

**(1) Acceptance Tolerance: 1.0 percent; and**

**(2) Maintenance Tolerance: 2.0 percent.**

All DC EVSE are exempt from **~~this requirement~~** **paragraph T.2.2** until January 1, 2028.

**NIST OWM Detailed Technical Analysis:**

The proposal outlined in agenda item EVF-23.6 is not exactly the same as an alternative proposal the EVFE SG was working toward in the group’s June 2022 ballot of its voting membership. In the case of the EVFE Subgroup, the wider tolerance of 5 % for DC systems installed before 2024 was identified by several OEMs as achievable, and the less than ideal existence of dual tolerances in the marketplace would be addressed by marking the accuracy achievable by devices which met only the wider tolerance. Granted some refining of the requirement text would be necessary the group’s alternate proposal addressed many concerns expressed by both OEMs and regulators when the Subgroup’s discussions on this topic first began in 2020.

NIST OWM was made aware of an October 15, 2022 letter from Florida and industry representatives from Electrify America, Tesla, EVGo, and Siemens sent to the NCWM S&T Committee. The co-authors of the letter summarized the EVF-23.6 proposal recommendations. The co-authors stated their beliefs about their comparison of EVF-23.6 to the Subgroup membership’s June 2022 balloted proposal and the subgroup’s position on EVF-23.6. On October 20th NIST OWM as convenors of the USNWG EVFE Subgroup sent to the NCWM S&T Committee a written response to the October 15th letter to clarify references made that imply the EVFE Subgroup’s approval or support of S&T Agenda Item EVF-23.6. Though the results of the Subgroup’s June 2022 ballot indicate the group’s support for modifications to tolerances and marking requirements was not to be construed as supporting the specific changes proposed in EVF-23.6. There were some key differences between the Subgroup’s June 2022 balloted proposal and EVF-23.6. Specifically, the Subgroup’s proposal did ***not*** include two different retroactive dates and differs in the magnitude of the tolerances and specific conditions under which they would apply, the permissible format required for markings, and had no reference to certification to the tighter of the dual tolerances. The convenors also clarified that the Subgroup would provide written and verbal input as explicitly directed by the group (shown below in the section under the subgroup heading).

The proposal in EVF-23.6 to include a new paragraph T.2.2. to address DC systems tolerances as worded permits a 5 percent tolerance for EVSEs installed pre- or post- 2024 on the condition this accuracy is declared in a “NOTICE”; however, if not bearing a notice, then the expectation is that regardless of the installation date a DC system will still be permitted operation at the proposed maximum 5 percent accuracy. Device tolerances should not henge on the presence of a temporary label (i.e., the “Notice” for accuracy does not have to be indelible). Equipment has been permitted multiple accuracy classes; however, those devices bear an accuracy class marking permanently at all times and that determination is made during type evaluation of the device. However, in many device codes there is only a single accuracy class for vehicle refueling applications.

Newly proposed subparagraph T.2.2.(a) specifies a 2034 sunset date for equipment with a 5 percent accuracy this is almost two decades after the EVFS Code was published and becomes the second enforcement date included in the tolerance specification. The DC tolerance requirement also includes a 2028 enforcement date proposed in July 2022 and then adopted in July 2022 as part of a priority item. That 2028 date appears as the current handbook edition as an applicable enforcement date in Agenda Item EVF-23.6. This proposal attempts to address DC systems tolerances when they are exempt from handbook test tolerances until 2028. There appears to be mixed opinions on the service life of EVSEs installed up through December 31, 2023 which would contribute further to the confusion about timelines for phasing out noncompliant equipment.

Agenda Item EVF-23.6 proposed new paragraph S.5.2.1, an accuracy marking requirement for DC systems installed before 2024, that would not be applicable if the EVSE is “certified.” Typically, references in the code to “certified” equipment are there to address requirements applicable to either test standards such as certified test weights or a reference scale, which are typically verified just prior to use and meet a performance level higher than that of the commercial device under test, or the device has undergone type evaluation and been issued a certificate. What would be the instructions for achieving this status given DC systems are not certified? NIST OWM concurs with the Committee on its post Interim Meeting decision to remove the term “certified” from proposed new paragraph S.5.2.1.

Moving forward with adoption before fully vetting proposals to modify fundamental requirements such as accuracy, transparency, or that ensure fair competition which are the foundation of every weighing and measuring device code can have unforeseen consequences. To delay or eliminate these basic guidelines (tools needed for this new device application) encourages nonuniformity (from state to state) which can be disruptive and impact the level of confidence in the marketplace. Proposals should be evaluated based on their impact on all stakeholders in the community. Time and again the community has moved to take corrective action on discovering an oversight that resulted from either the modification of existing or adoption of a new legal metrology requirement. It has been said when addressing the level of confidence that buyers and sellers have, and the accuracy with which these transactions are performed that: The consumer has no way to verify the accuracy of the transaction and must rely on the accuracy of the fuel dispenser.

NIST OWM encourages the community’s participation in the USNWG which began work in 2012 as a forum for stakeholders and other interested parties in establishing legal metrology standards (also the weights and measures infrastructure) for electrical energy measurements. That effort resulted in NIST HB 44 3.40 EVFS Code’s adoption in 2015. The four paragraphs that appear in multiple 2023 proposals address (1) dual EVSE tolerances (2.0 percent or 5.0 percent [DC EVSEs]); (2) new EVSE markings required for the wider tolerance in the marketplace (proposed new 5.0 percent accuracy for DC systems); and (3) corresponding accuracy test procedures are part of the EVFE SG’s meeting discussions. The EVFE Subgroup’s work continues having met October 6, 18, and December 8, 2022 and March 2 and 6, 2023 to address proposals under consideration for the 2023 cycle. It should be noted that the EVFE SG has worked to further refine the code as more is learned about these systems and since January 2020 met 18 times to consider the proposals the group submitted to the S&T Committee as well as those developed or under development outside of its forum to provide the group’s input. The EVFE SG will provide a clear statement of its exact position on agenda proposals when it reaches a consensus and provides this information in writing. The EVFE SG in July 2022 gained momentum on moving forward to recommend a wider tolerance of 5 percent only for DC systems installed before 2024 that must bear accuracy markings while maintaining for AC systems a 1 percent Acceptance Tolerance/2 percent Maintenance Tolerance and the more stringent tolerances would also apply to pre 2024 DC system models designed to meet the tighter tolerances and all other post 2024 DC systems. Where commercial equipment is known to operate at dual tolerances the proposed marking and performance requirements should be retroactive. NIST OWM concurs with the NEWMA recommendation to make the proposal applicable to coincide with the 2024 date for the installation and commercial use for systems specified in EVF-23.6 and in light of the EVSE code’s adoption almost a decade ago in 2015. Use of the terms “load” and “accuracy” should be reviewed for consistency in their use in the titles of the two T.2. subparagraphs. The statement adopted by the NCWM in July 2022 exempting DC devices from any tolerance requirements until 2028 remains in the proposal, yet there is a date of 2024 in both the proposed paragraph T.2.2.(a) and paragraph T.2.2.(b) which specifies requirements for DC devices installed prior to 2024. This is confusing and widens the gap: (1) in time delays in the application of tolerances in what will be a dual tolerance marketplace for DC systems (2) that encourages nonuniformity in equipment performance and (3) in the timely marking of information for consumer awareness. And the proposed sunset for equipment of 2034 is 20 years after the code’s adoption.

**U.S. National Work Group’s Electric Vehicle Fueling Equipment Subgroup (EVFE SG)**

* The EVFE SG agreed to forward the results of its June 2022 ballot (in which it proposed changes to the tolerances and the addition of marking requirements) to the S&T Committee and recommend the Committee consider these recommendations as it considers Items EVF-23.5 and EVF-23.6.
* In a June 2022 ballot, the SG agreed to recommend the following changes to the tolerances and marking requirements in Section 3.40 EVFS Code. The SG asked that the Committee consider the SG’s recommendations presented below as it deliberated on S&T Agenda Items EVF-23.5 and EVF‑23.6 which include proposed changes to these same handbook code paragraphs. The changes the SG was working towards in its June 2022 ballot are shown below.
* Additionally, some device users on the SG indicated that there remains a desire to recognize and then maintain a 5% tolerance for DC legacy (i.e., installed prior to 2024) equipment.

**T.2. ~~Load~~ Accuracy Test Tolerances.**

**T.2.1. EVSE ~~Load~~ Accuracy Test Tolerances for AC Systems**. – The tolerances for EVSE load tests **for AC systems** **~~are~~shall be as follows**:

1. Acceptance Tolerance:  1.0 %; and
2. Maintenance Tolerance:  2.0 %.

(Amended 202X)

**T.2.2. EVSE Accuracy Test Tolerances for DC Systems. – The tolerances for EVSE load tests on DC systems shall be as follows:**

1. **For DC systems installed prior to 2024 and that bear the notice specified in paragraph S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024, acceptance and maintenance tolerances are: 5.0 %.**
2. **For DC systems installed on or after January 1, 2024 or that do not bear the notice specified in paragraph S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024 tolerances are:**

**(1) Acceptance Tolerance: 1.0 %; and**

**(2) Maintenance Tolerance: 2.0 %.**

**(Added 202X)**

**S.5.2. EVSE Identification and Marking Requirements.** – In addition to all the marking requirements of Section 1.10. General Code, paragraph G-S.1. Identification, each EVSE shall have the following information conspicuously, legibly, and indelibly marked:

1. voltage rating;
2. maximum current deliverable;
3. type of current (AC or DC or, if capable of both, both shall be listed);
4. minimum measured quantity (MMQ); and
5. temperature limits, if narrower than and within – 40 °C to + 85 °C (− 40 °F to + 185 °F).

**S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024.** – **DC EVSEs installed prior to 2024 shall be marked with the following:**

**NOTICE:**

**“This charger operates at a tolerance of +/- 5 percent versus newer chargers which operate at a maximum tolerance of +/- 2 percent.”**

**This marking shall be conspicuously, legibly, and indelibly marked, in a position plainly visible to a person accessing a charging port of the EVSE.**

**This marking requirement does not apply to DC EVSEs that are capable of meeting an acceptance tolerance of 1 % and a maintenance tolerance of 2 %.**

**(Added 202X)**

(Amended 2021)

A July 12, 2023 memorandum reported on the March 2, 2023 ballot results of 6 Public Sector and 7 Private Sector members of the EVFE Subgroup resulting in 12 Approvals and 1 (Private Sector) vote in opposition to the Committee’s draft proposal for EVF-23.6. Voting results including all comments were made available May 5, 2023. Voting guidelines required 12 votes of approval from the 23 voting members on the subgroup roster. An April 6, 2023 EVFE SG ballot on the recognition of a digital accuracy statement was not approved by the SG.

**Summary of Discussions and Actions:**

The Submitters sent a letter dated May 8, 2023 to remind the Committee about a previous letter dated October 15, 2022 from the State Weights and Measures Director of Florida and industry representatives from Electrify America, Tesla, EVGo, and Siemens sent to the NCWM S&T Committee. The co-authors of the letter summarized the EVF-23.6 proposal’s recommendation for a 5 percent tolerance for DC systems installed before 2024 when so marked, if installed after 2024 or lacking the 5 percent markings, those DC systems would be subject to 1 percent/2 percent tolerance. The Submitters noted the October 4, 2022 announcement by NIST of a general consensus on a June 2022 balloted proposal of the USNWG EVFE Subgroup (the ballot was an attachment to the submitters’ October 15th letter). However, the submitters did not report the results of that ballot and it should be noted that the EVFE Subgroup did meet the threshold required to approve the June 2022 ballot. The Submitters’ response to the EVFE Subgroup member opposing the June 2022 proposal was to include a new 2034 expiration on the 5 percent tolerance as part of the proposal in item EVF-23.6. The submitters stated their beliefs about their comparison of Item EVF-23.6 to the Subgroup membership’s June 2022 balloted proposal and the Subgroup’s 2022 position on Item EVF-23.6.

A letter dated October 20, 2022 from NIST OWM as convenors of the USNWG EVFE Subgroup was sent to the NCWM S&T Committee in response to the October 15th letter co-authored by Florida, Electrify America, Tesla, EVGo, and Siemens. The letter was sent to clarify references made in the October 15th letter that implied the EVFE Subgroup’s approval or support of S&T Agenda Item EVF-23.6. Though the results of the Subgroup’s June 2022 ballot indicate the group’s support for modifications to tolerances and marking requirements this should not have been construed as supporting the specific changes proposed in Item EVF-23.6. There were some key differences between the Subgroup’s June balloted proposal and Item EVF-23.6. Specifically, the Subgroup’s 2022 proposal did ***not*** include two different retroactive dates and differed in the magnitude of the tolerances and specific conditions under which they would apply, the permissible format required for markings, and reference to certification. The convenors of the Subgroup will continue to provide written and verbal input as explicitly directed by the group.

In Conclusion: March 2023 deliberations of the EVFE SG resulted in a vote approving the proposal in Item EVF-23.6 as published in the 2023 NCWM Interim Meeting Report, followed by a July 12, 2023 memorandum indicating the group’s support of the proposal being sent to the NCWM S&T Committee. The series of events that lead to this conclusion were as follows: The EVFE Subgroup met on December 8, 2022, input based on the group’s discussions of S&T Item EVF-23.6 are provided above in the section of this analysis under the heading U.S. National Work Group’s Electric Vehicle Fueling Equipment Subgroup (EVFE SG). However, during the EVFE Subgroup March 2, 2023 meeting during its discussions on all S&T Agenda EVSE related proposals the Subgroup did vote to approve Item EVF-23.6 with six Public Sector and seven Private Sector votes resulting in 12 Approving and one Opposing (Private Sector) the Committee’s March 2023 version of EVF-23.6. The 12 votes of approval from the 23 voting members on the subgroup roster met the threshold of 12 for approval. The Subgroup acknowledged the Committee’s providing additional information in the accuracy notice statement to clarify the limits of the performance of unmarked DC systems is at a “maximum” tolerance of up to ± 2 percent. At the conclusion of its March 6th meeting and discussions the EVFE Subgroup considered further modifications to proposed new paragraph S.5.2.1. to recognize accuracy markings in digital format. An April 2023 ballot on a digitally formatted accuracy marking statement resulted in six Votes [three Public/three Private] to Approve and six Votes [two Public/four Private] in opposition which did not meet the threshold (12 of 23 voting members) for the Subgroup’s approving further modification of EVF-23.6 at that time. The Weight and Measures Community during its Standards Development Process has previously considered proposals for presenting required marking information in a digital format; therefore, for everyone continuing on with the development of similar requirements it is suggested those national discussions be revisited along with reviewing the comments received in the April 2023 EVFE Subgroup ballot that recommended specifying a minimum time of 30 seconds for the duration of the displayed accuracy statement and the statement be viewed in entirety prior to use of the EVSE.

At the 2023 NCWM Interim Meeting, the Committee considered the comments heard during open hearings and has assigned a Voting status to the item. The Committee worked on modifying the item based on the comments heard during open hearings and written comments submitted by NIST OWM and CDFA DMS to include:

* Further modifications by the Committee to proposed new paragraph S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024 included:
* eliminating the exemption for marking accuracy levels for EVSEs that hold an unspecified certification by removing the text “unless it is certified to the tolerances of T.2.2(b)” from the paragraph
* specifying in the accuracy notice statement that the EVSEs marked 5 percent tolerance are in contrast all “other” unmarked systems operating at more stringent tolerances which resulted in the removal of any reference to “newer” charging equipment
* providing more information on the accuracy limits of DC EVSEs that meet the 2 percent tolerance by specifying these systems operate at a “maximum” tolerance of up to ± 2 percent

Additionally, the Committee modified the conditions for displaying the accuracy markings in paragraph S.5.2. EVSE Identification and Marking Requirements by removing the term ”indelibly” and specifying this information must be “permanently” marked.

In proposed new paragraphs S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024and T.2.2. EVSE Load Accuracy Test Tolerances for DC Systems the Committee further clarified that this set of requirements apply to DC systems installed prior to January 1, 2024 *and* when the equipment has been “placed into service” prior to January 1, 2024.

**Regional Association Reporting:**

**Central Weights and Measures Association**

At the 2022 CWMA Interim Meeting, Scheleese Goudy (Electrify America) remarked a DC EVSE installed before 2024 will have 5 % accuracy until 2034. When the tentative code was written in 2015, historical data for AC measurements were readily available. DC metering technology was still in R&D. Tolerances could not be formulated. Legacy devices could reasonably meet 5 %, but not 1 %/2 %. This could require complete replacement of many legacy devices.

Francesca Wahl (Tesla): Rework of two above. Does not modify the 2028 date but provides a pathway forward. This proposal represents informal consensus of the NIST USNWG.

Craig VanBuren (Michigan) recommended the proposal move forward as Voting. Possible change: P 244, line 39 which “may” operate.

The CWMA S&T Committee believed this item is fully developed and recommended Voting status with the following changes:

**S.5.2. EVSE Identification and Marking Requirements.** – In addition to all the marking requirements of Section 1.10. General Code, paragraph G-S.1. Identification, each EVSE shall have the following information conspicuously, legibly, and indelibly marked:

(a) voltage rating;

(b) maximum current deliverable;

(c) type of current (AC or DC or, if capable of both, both shall be listed);

(d) minimum measured quantity (MMQ); and

(e) temperature limits, if narrower than and within – 40 °C to + 85 °C ( 40 °F to + 185 °F).

**S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024. – A DC EVSE installed prior to 2024 shall be marked with the following unless it is certified to the tolerances of T.2.2(b):**

**NOTICE:**

**“This charger operates at a tolerance of up to ± 5 percent versus other chargers which may operate at a tolerance of up to ± 2 percent.”**

**This marking shall be conspicuously and legibly displayed in a position plainly visible to a person accessing a charging port of the EVSE.**

**(Added 202X)**

**T.2. Test Tolerances.**

**T.2.1. EVSE Load Accuracy Test Tolerances for AC Systems.** – The tolerances for EVSE load tests for **AC systems** are:

(a) Acceptance Tolerance: 1.0 %; and

(b) Maintenance Tolerance: 2.0 %.

**T.2.2. EVSE Load Accuracy Test Tolerances for DC Systems. – The tolerances for EVSE load tests on DC systems shall be as follows:**

**(a) For DC systems installed prior to January 1, 2024, and that bear the notice specified in paragraph S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024, acceptance and maintenance tolerances are: 5.0 %. This paragraph T.2.2(a) shall expire on January 1, 2034; after that date, all DC EVSEs shall be subject to the tolerances of paragraph T.2.2(b).**

**(b) For DC systems installed on or after January 1, 2024, or that do not bear the notice specified in paragraph S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024 tolerances are:**

**(1) Acceptance Tolerance: 1.0 %; and**

**(2) Maintenance Tolerance: 2.0 %.**

All DC EVSE are exempt from **~~this requirement~~ paragraph T.2.2** until January 1, 2028.

At the 2023 CWMA Annual Meeting, Scheleese Goudy (Electrify America) stated the EVFE Subgroup approved this change. No objection to digital display. The 2028 exemption was just voted and approved at NCWM. If moved to 2024, there is no adequate test equipment to test DC chargers. A recent demonstration of a tester did not function correctly for DC testing. If the exemption date moves up, states would have to write policies to exempt devices?

Jared Ballew (ChargePoint) indicated the original intent was to display the notice digitally or physically. And has concern that current wording does not make it clear that digital display of the notice is acceptable. Retrofitting existing equipment with physical markings would be cost prohibitive. And then the same when the notice is removed in the future. He does not support proposal without the clear allowance for digital display. No problem with moving the date to 2024, they’ve known this tolerance expectation for years. But agrees that the availability of (lack of) test equipment, would cause a problem.

Loren Minnich (NIST OWM) indicated NIST OWM would recommend that the S&T Committee provide guidance on the intent and implementation of three enforcement dates in proposed new paragraph T.2.2. EVSE Load Accuracy Test Tolerances for DC Systems to ensure regulators, the service industry, EVSE and test equipment manufacturers, and operators can smoothly transition equipment into commercial use and eventually meet the tighter tolerance. This is more important because the exemption granted for “All DC EVSE“ tolerances until January 1, 2028 remains in code paragraph T.2. creating a four-year gap that impacts the proposed new dual tolerance system (i.e., the straightforward application of two separate tolerances from a pre2024 and post 2024 generation of equipment standpoint). The 2028 enforcement date is a sharp contrast to the enforcement dates prescribed in the submitters’ first statement on their purpose for the proposal of creating “1 % (acceptance) / 2 % (maintenance) tolerances would apply to devices installed after January 1, 2024. For devices installed before that date, the tolerances would be 5% (acceptance and maintenance).” The tracking of equipment is critical and may require more work because locations are obscure and not attended (requiring more investigative work to communicate with the operator and billing agent) also since placed in service policies vary from jurisdiction to jurisdiction.

At the NEWMA Regional Meeting a proposal was made and adopted to recommend the January 1, 2028 date be amended to January 1, 2024. If accepted by the NCWM S&T Committee the earlier date could eliminate the potential confusion in the implementation of this requirement. This would allow each jurisdiction the discretion to implement these accuracy requirements as test equipment becomes available to place devices into service. This would eliminate the current exemption from any tolerances for DC systems and would provide industry with firm requirements on which to base test equipment capabilities and EVSE devices capable of meeting these requirements. There would still be two sets of tolerances based on the date of installation, prior to January 1, 2024 and after January 1, 2024 depending on equipment capability or markings as described in paragraph S.5.2.1. Marking of Accuracy Limits, DC EVSEs Installed Prior to 2024.

Monica Martinez (Tesla) supports voting. Important to address new technology. Support the idea of digitally and agree as long as voting in July is preserved. The 2028 exemption is the same that was voted on at NCWM. No evidence that anything has changed to warrant the exemption date being moved (testing equipment still not available).

Craig VanBuren does not support changing date from 2028. Supports digital allowance if it says the notice must be displayed prior to the transaction.

The Committee recommends this item remain voting status with the following change to S.5.2.1. (S&T – 353, Lines 4 and 5):

**This marking shall be conspicuously and legibly displayed in a position plainly visible to a person accessing a charging port of the EVSE. The indicating element may be used to display this notice, provided the notice is presented to the customer prior to the beginning of the transaction.**

**Western Weights and Measures Association**

During the WWMA 2022 Annual Meeting the following comments were received:

Scheleese Goudy (Electrify America) commented on the metering technology for DC chargers are now becoming available as technology develops. Scheleese Goudy proposed previously installed devices will not be able to meet the 1 and 2 % tolerances. Scheleese Goudy commented the tolerances are being developed with separate tolerances for legacy devices that can’t meet the proposed requirements. Scheleese Goudy stated there was a vote of 11-1 in favor of the item in the assigned work group. The 1 no vote said that it would have been a yes if there was a 10-year sunset. Scheleese Goudy stated the changes to the item incorporated the change to include a 10-year sunset of legacy devices. Scheleese Goudy commented devices would be marked for the public and inspectors with the required tolerances. Scheleese Goudy recommended Voting status.

Kevin Schnepp (California Division of Measurement Standards) commented this was discussed in the national workgroup. Kevin Schnepp recommended that a task group be assigned to verify which items were in a consensus and which were not. Kevin Schnepp proposed a hard stop date for legacy devices is necessary and that there isn’t one with the current language. Kevin Schnepp commented on his disagreement with the "or" statement in the current language.

Francesca Wahl (Tesla) commented Tesla agrees with the comments made by Electrify America. Francesca Wahl commented the language is to include a hard stop date of legacy devices and supports the removal of “or” from the language.

Chris King (Siemens) commented Siemens agrees with Tesla’s comments.

During open hearings, comments were heard that the contents in this item were previously discussed in the USNWG, but no official position has been taken by the USNWG. There were also comments during open hearing taking the position the item is not fully developed. The WWMA S&T Committee recommended the submitters work with the USNWG to develop one proposal by combining language from EVF-23.5.

The WWMA S&T Committee recommended that this item be blocked with item EVF-23.5. The WWMA S&T Committee recommended the new blocked items be assigned a Developing status.

**Southern Weights and Measures Association**

The following comments were received during the 2022 SWMA Annual Meeting:

Hal Prince (Florida) spoke in favor of this item being a satisfactory compromise.

Paul Floyd (Louisiana) stated that he would rather not have devices with warning labels for accuracy.

Scheleese Goudy recommended this move forward as a Voting Item.

John Stokes (South Carolina) stated that he supported the use of warning labels for these devices and supported this item.

The SWMA S&T Committee recommended this item move forward as a Voting Item.

**Northeastern Weights and Measures Association**

At the 2023 NEWMA Interim Meeting, Keith Bradley (Electrify America) recognizes that when the code was originally adopted there was questions about DC meters being able to meet a 1 % and 2 % tolerance. This item is to make sure devices are properly marked for the consumer as installed before 2024 and 5 % tolerance. If devices are not marked this way, the 1 % and 2% tolerances would apply. Installed devices would have the larger tolerance until 2034, then revert. Francesca Wahl recommends Voting status. Juana Williams (NIST OWM) noted that there is a letter from NIST to indicate that a status update on this item is forthcoming and has info to address marking and tolerances for DC systems. In a June meeting by the EVSE Subgroup, there was no 2028 retroactive date being considered and the proposal they reviewed included different sets of tolerances and marking requirements based on install date. Jason Flint (New Jersey) requested that this item be given a Developing status as there is too much debate and too many questions. Jason Flint suggested that the submitters of EVF-23.5 and EVF-23.6 work together to develop further.

After hearing comments from the floor, the Committee believes the item is not fully developed and several questions need to be answered. The Committee is recommending that this item be given a Developing status.

At the 2023 NEWMA Annual Meeting, Scheleese Goudy provided a letter from the submitters and supports as voting. Alicia Artessa (Tesla) supports as voting. Jared Ballew did not support the item as currently drafted, only with minor modification to S.2.5.1, as follows: “This marking shall be conspicuously and legibly displayed in a position plainly visible to a person accessing a charging port of the EVSE. The indicating element may be used to display this notice, provided the notice is presented to the customer prior to the beginning of the transaction.” He believes the original intent of the proposal was that the notice would be available digitally. Loren Minnich (NIST-OWM) indicated that the NCWM S&T Committee should provide guidance on 3 different dates listed in the proposal. Scheleese Goudy supports ChargePoint’s proposal of modifying the language in S.2.5.1.

After hearing comments from the floor, the Committee recommended to the body that this item maintain a voting status with no changes. However, during discussion, Lou Sakin (Hopkinton, Massachusetts) requested that the date pertaining to DC EVSE be changed from 2028 to 2024. Lou Sakin stated that at the time the EVSE code became permanent in Jul 2022, testing equipment was not readily available to DC chargers, however, it has been demonstrated that the equipment is now available and enforcement agencies should have the ability to use it to enforce the tolerances. A suggestion was made by Ethan Bogren (Westchester County, New York) to change the date to 2025. Scheleese Goudy disagrees that the technology is not available yet and does not support changing the date. Support for changing the date to 2024 was heard from Lou Sakin, James Cassidy (Massachusetts), Walt Remmert (Pennsylvania), Jim Willis (New York), Ms. Cheryl Ayer (New Hampshire), and Jared Ballew (ChargePoint).

After hearing discussion, the body voted to recommend to the NCWM S&T Committee to maintain a voting status with the following further changes to the current last sentence in T.2. Load Test Tolerances which applies to DC EVSEs to read:

All DC EVSE are exempt from **~~this requirement~~paragraph T.2.2.** until January 1, 2028.

1. Idaho National Laboratory, “Plugged In: How Americans Charge Their Electric Vehicles,” p.14, <https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf>. [↑](#footnote-ref-1)
2. As the California Energy Commission has explained, “it is therefore useful to treat infrastructure for interregional travel (predominantly DCFCs) differently from infrastructure for intraregional travel (predominantly Level 1 and Level 2 chargers).” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=233986&DocumentContentId=66805> at page 14. [↑](#footnote-ref-2)
3. <https://shop.nist.gov/ccrz__ProductDetails?sku=56110S&cclcl=en_US>. [↑](#footnote-ref-3)
4. Cal. Dept of Food & Agriculture, Final Statement of Reasons on Electric Vehicle Fueling Systems, p.23 (Nov. 1, 2019). [↑](#footnote-ref-4)
5. Id. [↑](#footnote-ref-5)
6. <https://shop.nist.gov/ccrz__ProductDetails?sku=56110S&cclcl=en_US> [↑](#footnote-ref-6)
7. Charging cables are themselves complex objects, with liquid coolant and high-voltage insulation. Cables for fast DC chargers that include additional high-voltage sensing leads were not available in 2015. [↑](#footnote-ref-7)
8. **https://**[**www.cdfa.ca.gov/dms/pdfs/regulations/EVSE\_ISOR.pdf.**](http://www.cdfa.ca.gov/dms/pdfs/regulations/EVSE_ISOR.pdf) [↑](#footnote-ref-8)
9. Michael Nicholas, “Estimating electric vehicle charging infrastructure costs across major U.S. metropolitan areas,” ICCT Working Paper 2019-14, p.2 tab. 2 (Aug. 2019),[**https://theicct.org/sites/default/files/publications/ICCT\_EV\_Charging\_Cost\_20190813.pdf**](https://theicct.org/sites/default/files/publications/ICCT_EV_Charging_Cost_20190813.pdf). [↑](#footnote-ref-9)
10. Id. at 4 tab. 4. [↑](#footnote-ref-10)
11. According to the AFDC’s station locator database, there are 6,580 DC stations with 22,767 chargers. The AFDC also reports that the number of DC ports grew 29% year-on-year to the second quarter of 2021. [**https://afdc.energy.gov/files/u/publication/electric\_vehicle\_charging\_infrastructure\_trends\_second\_quarter\_2021.pdf**](https://afdc.energy.gov/files/u/publication/electric_vehicle_charging_infrastructure_trends_second_quarter_2021.pdf). With growth at this rate, about 6,600 additional DCFC stations will be installed in 2022 and 2023, leading to a total of about 36,000 DC chargers that would be “pre-2024” chargers under the proposal. [↑](#footnote-ref-11)
12. A charger that is not qualified for a given tolerance level may well be within the bounds of the tolerance, because there is some distribution in metering performance. Even if devices are replaced only after inspection, a significant fraction would need replacement, thus incurring this scale of cost. Moreover, it might be most sensible for an operator to ensure all its devices are qualified, rather than waiting to see what the results of inspection might be for a given charger. [↑](#footnote-ref-12)
13. Cal. Department of Food & Agriculture, Final Statement of Reasons, p.6. [↑](#footnote-ref-13)
14. California. Code of Regulations § 4002.11; Rev. Code Wash. § 19.94.190(6). [↑](#footnote-ref-14)