UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899

June 29, 2022

MEMORANDUM FOR NCWM Specifications and Tolerances (S&T) Committee

From: Tina G. Butcher, Chairman
U.S. National Work Group (USNWG) on Electric Vehicle Fueling and Submetering (EVF&S)
Electric Vehicle Fueling Equipment (EVFE) Subgroup

Subject: Recommended Modifications to S&T Committee Agenda Voting Item EVF-20.1 S.1.3.2. EVSE Value of Smallest Unit

The USNWG EVF&S's Electric Vehicle Fueling Equipment (EVFE) Subgroup respectfully submits the following recommendations for further modification of S&T Committee Agenda Item EVF-20.1, a proposal to modify NIST Handbook 44 Section 3.40 Electric Vehicle Fueling Systems (EVFS) – Tentative Code paragraph S.1.3.2. EVSE Value of Smallest Unit. The EVFE Subgroup's alternate proposal is the result of six years of EVSE testing and discussion by stakeholders in the community.

The EVFE Subgroup's alternate proposal for modifying Agenda Item EVF-20.1 includes two parts: (1) a slight modification to the Item Under Consideration that results in a specification that more appropriately addresses the smallest display unit for both AC and DC systems; and (2) further clarification to the unit of measurement permitted for use with these systems and its size as well as removing unwarranted testing procedures. Should the S&T Committee decide the second part of the alternate proposal cannot occur without downgrading the item's status, the EVFE Subgroup requests the Committee permit those proposed modifications be submitted separately in a 2023 Form 15 proposal (which NIST Office of Weights and Measures will prepare on behalf of the EVFE Subgroup) to modify NIST Handbook 44.

At minimum, the EVFE Subgroup proposes the modifications outlined to paragraph S.1.3.2. shown below for adoption in July 2022. A summary of the areas changed and the EVSE Subgroup's rationale for these changes is provided following the recommended language.

S.1.3. EVSE Units.

S.1.3.2. EVSE Value of Smallest Unit. – The value of the smallest unit of indicated delivery by an EVSE, and recorded delivery if the EVSE is equipped to record**~~, shall be 0.005 MJ or 0.001 kWh.~~:**

(a) for AC systems shall not exceed 0.0001 kWh;

(b) for DC systems shall not exceed 0.001 kWh; and

(c) the value of the kWh shall be expressed only as a decimal submultiple of 1 that satisfy (a) and (b).

(Amended 202X)

Rationale for the Proposed Changes to Paragraph S.1.3.2. EVSE Value of Smallest Unit:

- For AC EVSEs
  (1) The AC systems' requirements for a display unit value are modified to not be greater than 0.0001 kWh consistent with the national proposal.
  (2) The proposed modification to a display unit value of 0.0001 kWh resolution for AC EVSE is necessary to conduct testing to determine compliance with accuracy requirements in a minimal amount of time.
  (3) The current display resolution of 0.001 kWh required in the EVFS code for AC systems would result in 25% of the EVSE tests being incorrectly evaluated on a pass/fail basis.

- For DC EVSEs
  (1) Due to the power levels for DC systems the EVFE Subgroup recommends keeping the value of the kWh unit as it currently appears in the NIST HB 44 design requirement (0.001 kWh or smaller).
  (2) The EVFE Subgroup's recommendation for no changes to the current value of the DC EVSE smallest display unit specified in the handbook is actually less of a change for DC systems than that recommended in the national proposal for DC systems.
  (3) The EVFE Subgroup has received support for keeping the value of 0.001 kWh from jurisdictions who will begin testing of DC systems shortly.

- For Naming the Unit
  (1) The EVFE Subgroup also recommends removing all reference in the code to the megajoule (MJ) since this unit of measurement is not recognized for electrical energy in the SI system.
  (2) According to comments from many electric vehicle metering industry participants in the EVFE Subgroup, the megajoule is not presently used in commercial applications in the U.S.

Additional Proposed Changes:

The EVFE Subgroup also recommends additional modifications to the seven paragraphs and definition shown below move forward for adoption in July 2022 under EVF-20.1. These changes have been reviewed and discussed at length by the EVFE Subgroup, which includes representatives from regulators, manufacturers, and users of electric vehicle fueling systems. However, the EVFE Subgroup is open to further guidance from the Committee on moving these proposed modifications forward for adoption.

- Paragraph S.1.3.1. EVSE Units of Measurement and Definitions for "megajoule (MJ)"

The EVFE Subgroup developed recommendations for modifying the following paragraph and definition to eliminate the use of the megajoule unit of measurement as follows:

> **S.1.3.1. EVSE Units of Measurement. –** EVSE units used to charge electric vehicles shall be indicated and recorded in ~~**megajoules (MJ) or**~~ kilowatt-hours (kWh) and decimal subdivisions thereof.
>
> **(Amended 202X)**
>
> ~~**megajoule (MJ). An SI unit of energy equal to 1 000 000 joules (J). [3.40]**~~

- Paragraph S.2.5.1. Money-Value Divisions Digital

The computed total price for the sale of electrical energy shall be based on an EVSE using a quantity interval that does not exceed 0.01 kWh rather than 0.1 kWh as currently specified or in units of the megajoule. The EVFE Subgroup also recommends removing the megajoule unit of measurement from paragraph S.2.5.1. Money-Value Divisions Digital as shown below:

S.2.5.1. Money-Value Divisions Digital. – An EVSE with digital indications shall comply with the requirements of paragraph G-S.5.5. Money-Values, Mathematical Agreement, and the total price computation shall be based on quantities not exceeding **~~0.5 MJ or~~** 0.**0**1 kWh.

(Amended 202X)

- Paragraph S.8. Minimum Measured Quantity (MMQ)

The EVFE Subgroup recommends modifying paragraph S.8. Minimum Measured Quantity (MMQ) as shown below to recognize an MMQ of 0.1 kWh which is very common among EVSE that have already been type approved. For ANSI C12 compliant meters meter constants of 0.001 kWh are common. In these meters the meter is expected to be fully accurate at deliveries of only a single watthour (i.e., 0.001 kWh). Dispensing a larger amount of energy to determine accuracy is not needed. Additionally, the EVFE Subgroup recommends paragraph S.8 specify an MMQ not to exceed 1.0 kWh as a more appropriate quantity for DC systems and include a new note to encourage a smaller MMQ for EVSEs which in the case of AC systems will result in a shorter time to conduct a test by a factor of five.

S.8. Minimum Measured Quantity (MMQ). – The minimum measured quantity shall satisfy the conditions of use of the measuring system as follows:

(a) Measuring systems shall have a minimum measured quantity not exceeding **~~2.5 MJ or~~:**

(1) 0.5 kWh for AC EVSE; and

(2) 1.0 kWh for DC EVSE.

Note: To minimize the duration of required testing, manufacturers may want to consider limiting the declared MMQ to the level of 0.1 kWh for AC EVSE.

(Amended 202X)

- Paragraphs Addressing the No Load Test and Starting Load Test

The EVFE Subgroup also recommends removing the No Load Test and Starting Load Test notes and their corresponding tolerances from the code requirements because these conditions are never encountered by a customer. An EVSE never operates at no load for any significant time. The Starting Load Test should not be required because the EVSE never operates at 0.5A load. Consequently, also modify the relevant handbook requirements as follows:

~~N.1. No Load Test. A no load test may be conducted on an EVSE measuring system by applying rated voltage to the system under test and no load applied.~~

~~T.5. No Load Test. – An EVSE measuring system shall not register when no load is applied.~~

~~N.2. Starting Load Test. A system starting load test may be conducted by applying rated voltage and 0.5 ampere load.~~

~~T.6. Starting Load. – An EVSE measuring system shall register a starting load test at a 0.5 ampere (A) load.~~

Renumber paragraph N.3. Minimum Test Draft (Size) through N.6. Repeatability Tests to become N.1. through N.4., respectively.

For questions about these suggested modifications to S&T Committee Agenda Item EVF-20.1, please contact me by email at: tina.butcher@nist.gov or by telephone at: (301) 975-2196 or Juana Williams (NIST OWM), USNWG

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