December 20, 2018

Mr. James Kwon
U.S. Environmental Protection Agency
ENERGYSTAR Program
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: Comments on ENERGYSTAR Specification for Electric Vehicle Supply Equipment Version 1.1

Dear Mr. Kwon,

We appreciate the opportunity to provide comments and feedback on the proposed ENERGYSTAR specification for electric vehicle supply equipment, EVSE 1.1, regarding direct current fast charging (DCFC). These comments are submitted on behalf of DCFC manufacturers, owners, and operators. The undersigned provides DC fast-chargers for a spectrum of vehicles, including, passenger vehicles, buses, delivery trucks, long-haul trucks, and other specialty vehicles.

Combined the undersigned manufacturers produced over 85% of the installed base of DCFC in the U.S. And the undersigned charging networks own or operate the two largest DCFC charging networks.[1]

Energy efficiency is important to the EV charging industry, as wasted kilowatts are an operational cost and impact the business case for EV charging infrastructure. Accordingly, the industry works to ensure its chargers are as efficient as possible while still providing best in class technology and customer experience at a reasonable cost. With that in mind, we believe that it is premature at this time to issue an energy efficiency certification or standard for DCFC.

Given the nascence of DCFC, the variety and complexity of EV charging infrastructure and use-cases, and the rapidly evolving nature of DCFC technologies and industrial standards, an efficiency standard at this time for all DCFC could negatively impact innovation, customer choice, and cost.

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[1] October 22, 2018 “Four Networks Maintain over 60% of 22,343 Level 2 and DC Fast Charging Stations.” U.S. Department of Energy, available at: https://www.energy.gov/eere/vehicles/articles/fotw-1052-october-22-2018-four-networks-maintain-over-60-22343-level-2-and-dc

Therefore, we respectfully request that EPA:

1. **Limit the scope** of the ENERGYSTAR certification for DCFC to well-understood charging technology which has already been deployed in the field for at least a few years, like, for example, DCFC systems rated at 50kW or less.

2. **Extend and Expand the Process** for developing the standard, including the timeline for developing the standard, the stakeholders involved, and the number and locations of meetings.

3. **Allow Self-Certification and Testing** for compliance with the standard.

Varied Use-Cases
As dictated by their specific use-cases, there is a wide and growing spectrum of DCFC equipment (50kW to 1,000kW+) and technologies, which makes a single efficiency standard impractical. As electric vehicle technology continues to improve, deployments increase, and costs come down new use-cases for EV charging are developing.

For example, the technology and power needs of highway charging for passenger vehicles, which need high power delivered quickly, is different from a fleet of delivery trucks that can charge at the depot over night, but have high power demands due to the aggregate capacity of the fleet's batteries. These scenarios themselves differ from, for example, a fleet of Class-8 long haul trucks that could require a megawatt of power per truck to be delivered quickly between driver shifts to allow the trucks to get back on the road. There are many other charging use cases including, for example, fork lifts, port equipment, airport vehicles, on route transit bus charging, and on route transit bus flash charging. For many of these use cases, charging technology is in the early stages of development, initial pilots, and deployment.

Nascent and Rapidly-Evolving Technology
To meet the varied and changing demands of EV owners, DCFC technology is evolving rapidly and the future installed base of DCFC will look different from the installed base of today. Even the most basic and common technology decision, like CCS or CHAdeMO, can lead to efficiency differences. A single efficiency standard for DCFC based on today's technology will likely limit development of innovative designs that could lead to lower cost and would effectively, if unintentionally, be picking winners and losers.

The bulk of currently deployed DCFC infrastructure has been in the field for fewer than five years. Most of the existing installed base of public DCFCs are rated between 50kW and 75kW. In 2018 alone, DCFC saw changes with deployments of 150kW and 350kW liquid-cooled chargers for highway charging of passenger vehicles to 600kW over-head pantograph chargers for transit buses that can charge buses in 3 to 6 minutes while they are on the route. These products and technologies have very different architectures from the installed base of 2017.

Looking to 2019 and beyond, technology providers are developing medium-voltage solid state extreme fast chargers; high-power wireless charging for heavy-duty drayage trucks; extreme fast chargers that plug directly into the medium voltage distribution grid; and for Class-8 trucks that can require 3,000kW, charging systems are being designed with multiple connectors for a single vehicle.

With the short history of new high power charging (150kW+) and the rapid movement toward higher power (1 MW+), industry understanding of the operational characteristics of DCFC (>50kW) is still developing. Real-world experience will rapidly impact future designs and technology choices and efficiency standards issued today could artificially limit improvements which would deliver value to customers.

Different System Architectures Can Impact Efficiency and How it is Measured
At the most basic technology architecture level, lower power DC chargers are very different from high power DC chargers. For example, lower power 10 kW bi-directional DC home chargers use the architecture of "power supplies" which are optimized for low cost and high production volume. While the highest power chargers derive their technology from industrial drives, whose design was optimized for reliability and customization.

Higher power DCFC systems can have further, significant variations, from transformers, to power cabinets, to dispensers, to cabling, to cooling systems, to power protection systems, to layout, to footprint, to grid connection. Each installation may require the deployment of a different mix of technologies. Importantly, some of the individual technologies to meet the needs of the different use-cases are still in relative infancy.

Charging elements that create additional losses include auxiliary controls pumping the liquid of the liquid-cooled cables, and in the case of a medium voltage (up to 69kV) chargers, the electrical substations might be considered. In some cases, the rectifiers in a charging system can be separate units and far apart, impacting efficiency. In more complex architectures, a single transformer feeds multiple chargers through a multitude of secondary windings and only a portion of those chargers (and secondary windings) are active at any time, altering the definition of a charger and its efficiency.

Integrating on-site energy storage to a charging system could also impact measured efficiency. Charger efficiency will be different depending on how the energy storage is implemented. Embedded DC connected storage architecture will likely have a lower efficiency and higher stand-by power when compared to a charger with an AC connected energy storage system. Additionally, system design trade-offs are often made between demand charges, electrical service limitations, and energy storage, let alone charger efficiency.

Due to the unique characteristics of charging stations, some of which have been described here, there is no agreed upon standard for testing efficiency by any standards body. A lack of any predefined testing method and criteria makes the inclusion of DCFC into the ENERGYSTAR certification program especially problematic.

Program Disqualification Risks
Although ENERGYSTAR is a voluntary standard, funding program qualifications for DCFC infrastructure may require ENERGYSTAR certification, once available. Program administrators may consider ENERGYSTAR-certified products as superior, even if alternative fast charging configurations are better suited for their use-case or if more efficient products are available but do not match certification criteria. As such, an ENERGYSTAR certification at this time, even if voluntary, may limit more efficient and cost-effective products from being developed.

Extend and Expand the Process
Given the variety of use-cases and nascent and rapidly developing DCFC technologies, the timeline for the efficiency standard setting process under ENERGYSTAR should be extended, and the stakeholders involved should be widely expanded. The vast majority of DCFC EVSE manufacturers and network owner/operators, including the undersigned, only recently became aware that EPA was undertaking an ENERGYSTAR certification for DCFC. Most electric utilities are unaware of this

process and aside from the undersigned, most electric passenger vehicle, transit bus, and truck OEMs have not been involved.

To be more inclusive and raise awareness, EPA should endeavor to engage EV stakeholders around other industry events such as CharIn to ensure sufficient participation and engagement. In recognition of this, EPA should extend the timeline proposed on slide 25 of the "Second Working Session Slide Deck," and organize additional meetings.

Allow for Self-Certification and Testing
DCFC systems are large, complex and require rapid real-time prototyping in real-world applications. Many DCFC systems, particularly high power systems for fleets, medium and heavy duty trucks, and buses, are not operational or testable until they are installed and commissioned in the field. This makes third-party laboratory testing difficult if not impractical, which is in part, why there is not an existing third-party testing regime. Accordingly, we respectfully request that EPA allow manufacturers to self-certify products as per ENERGYSTAR specifications, or to identify similar methods to certify and minimize cost and times required for testing.

Summary
We believe that energy efficiency plays an important role in ensuring the success of EV charging deployments. However, for the stated reasons, we believe setting a broad efficiency standard for DCFC at this time is premature and could have adverse impacts on the electric vehicle and electric vehicle charging products and services markets. Introducing a new standard, even if voluntary, could stifle innovation and technology development, negatively impact customer choice, and create a pricing headwind for EV charging infrastructure.

Therefore, we respectfully request that EPA:

1. **Limit the scope** of the ENERGYSTAR certification for DCFC to well-understood charging technology which has already been deployed in the field for at least a few years, like, for example, DCFC systems rated at 50kW or less.

2. **Extend and Expand the Process** for developing the standard, including the timeline for developing the standard, the stakeholders involved, and the number and locations of meetings.

3. **Allow Self-Certification and Testing** for compliance with the standard.

We welcome the opportunity for further engagement with the EPA to discuss next steps and a more reasonable timeline and scope for implementing such a standard. Thank you for your consideration of our comments and please do not hesitate to reach out if we can be a resource to you as we work collectively to increase efficiency in the transportation electrification space.

Sincerely,

ABB
BTCPower
Delta
Efacec

EVgo
Siemens
Tesla
Tritium