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Terawatt Infrastructure comment on RFI for Medium- and Heavy-Duty Zero Emission Vehicle Public Charging

Additional submitted attachment is included below.

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California Energy Commission
Docket Unit, MS-4
715 P Street
Sacramento, California 95814

February 7, 2025

Re: Request for Information Medium- and Heavy-Duty Zero Emission Vehicle Public Charging, 19-TRAN-02

Dear Staff of the California Energy Commission,

Thank you for the opportunity to inform the California Energy Commission's (CEC) work to define public charging in 19-TRAN-02. Terawatt Infrastructure (Terawatt) provides these comments informed by our experience as a charging provider for commercial fleets, and our mission to provide fleets with the most reliable network of charging solutions. Terawatt has charging sites under development across California designed to provide fleets of all sizes and vehicle types with direct current fast charging to enable a lower cost per mile for goods and people movement. Terawatt owns, develops, operates and manages charging facilities for these customers across several product offerings including corridor charging sites, shared charging depots, built to suit charging sites, and behind-the-fence charger management.

Terawatt also appreciates the efforts of the CEC to support the state-wide deployment of fleet charging infrastructure through the development of the 2024 Zero-Emission Vehicle Infrastructure Plan, by funding fleet charging projects through the CEC's Clean Transportation Program (CTC), and crafting regulations that balance consumer protection and innovation. We look forward to informing CEC's work to support the fleet charging industry, and continued partnership in deploying reliable, ubiquitous infrastructure to meet the needs of fleets who choose electrification.

Sincerely,

Sam Vercellotti
Director of Policy
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About Terawatt Infrastructure

Terawatt Infrastructure (Terawatt) is a California-based company building a nationwide network of charging solutions for light-, medium-, and heavy-duty fleet vehicles. Terawatt provides convenient, reliable charging infrastructure that keeps fleets who choose to electrify running efficiently. Terawatt develops, operates, and maintains charging sites bolstered by operational software and maintenance solutions. Terawatt manages more than \$1 billion of capital and land assets to deliver this network of charging sites. With a purpose-built platform that combines a robust portfolio of property assets, capital, asset financing capabilities, and energy and project development expertise, Terawatt is filling the multi-trillion-dollar investment gap in fleet charging infrastructure and leading the way in this pivotal moment in the transition to a zero-emission transportation sector and clean energy economy.

RFI Question Responses

(1) What does the CEC need to consider when developing “public” / en route charging eligibility criteria for CEC funding opportunities?

Terawatt appreciates the CEC’s work to fund innovative clean transportation projects across the state and its willingness to solicit stakeholder input on scoping future funding opportunities. Terawatt provides two overall recommendations in response to this question:

- Recommendation 1: The CEC should consider hybrid public- and shared-private sites to meet the definitions of “public” for its funding opportunities. A hybrid model could be termed “shared-public”; and
- Recommendation 2: The CEC should consider the eligibility of shared-private sites in future funding opportunities in addition to hybrid “shared-public” sites. These shared-private sites deliver significant public benefits and can serve large numbers of fleet vehicles each day at optimized utilization levels to reduce costs for all site users.

Recommendation 1 - The need for hybrid shared-public sites

Hybrid shared-public sites yield significant public benefits and should be considered to meet requirements for public access. A hybrid shared-public site involves a certain number of ports that are available for public reservation, while other stalls can be reserved on a longer term basis. This model allows charging developers to sign an agreement with an “anchor” customer that provides predictable utilization by reserving stalls on a longer term basis. At the same time, this anchor customer would create beneficial site level economics that can support a portion of the site being set aside for individual charging session reservations, a segment of overall demand that is much more nascent compared to fleets who are willing to contract for guaranteed access to charging. Over time, these anchor customers will support the expansion of the third party charging model as well as the buildout of additional sites across the state.



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The model is tailored to meet fleet preferences which Terawatt has observed in its outreach to customers. Anchor customers seek certainty of access to charging and are willing to contract for an amount of a site's overall capacity, but may not provide enough demand to justify a fully leased site for themselves. This preference from fleets runs counter to the public access eligibility in many CEC and federal grant programs, despite the model serving as an important force multiplier for the broader deployment of electric trucks and associated infrastructure. The hybrid shared-public site model harnesses the power of this preference to anchor the fleet customer in the site and ensure it has offtake certainty and high asset utilization (unlocking more capital for further infrastructure investments in a virtuous cycle). In the case of public access eligibility as currently defined in many CEC programs, fleets are essentially prevented from becoming anchor tenants, even as they also cannot justify building infrastructure in their own depot or leasing an entire site for themselves. However, these fleets are still very interested in the total cost of ownership (TCO) savings associated with electrification, and plan to move forward with the addition of electric trucks into their existing operations only under the condition of guaranteed access to infrastructure on a pre-scheduled basis.

Critically, Terawatt also urges the CEC to regard the use of a reservation system, which Terawatt views as a base requirement for efficient and reliable operation of a truck charging facility, to not be a factor when considering whether a site is publicly accessible or not. Fully public sites with unrestricted access to chargers also benefit from improved reliability brought about by a reservation system as the use of a reservation system eliminates the prospect of a truck arriving to find a site fully at capacity. There are a finite number of charging sessions available per day at each truck charging site, naturally limiting access to a site to begin with. By rationalizing access through a reservation system, access is actually maximized. Terawatt has expanded on the benefits of a reservation system in other responses to this request for information.

Recommendation 2 - Eligibility for shared depots in CEC discretionary funding opportunities

Terawatt recommends that the shared depot model be given eligible pathways to apply for CEC grant funding. This eligibility should be implemented in addition to the expansion of the definition of "public" to include hybrid sites as a separate matter of CEC policy.

Shared depots are charging sites that serve multiple fleet users through a contractual arrangement with a third-party site owner and operator. Fleets are guaranteed access to charging infrastructure through a contract at a specified price, similar to diesel fuel contracts that fleets are already used to using to guarantee fuel pricing over a period of time. Shared sites differ from private depots which are often smaller scale deployments of charging at a fleet's owned facility, only accessible to a single fleet. These private depots often struggle to lock-in the necessary power to charge electric trucks at scale because they were not sited with access to power in mind. Shared depots can unlock



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new charging capacity as third party providers specialize in securing properties that have sufficient power available to charge a significant number of users. These sites are purpose built to charge electric trucks and combine power, operations and management capabilities, and long-term stewardship to create a reliable off-site solution for fleets to charge at scale. With more power, less risk held by fleets who do not want to own and operate infrastructure, and significant expertise in charging, third-party shared depot operators offer fleets significant value in reducing costs associated with the electric transition. The shared nature of these sites versus a private charging facility also allow for more vehicle throughput and associated emissions reductions.

The shared depot business model is an emerging solution for commercial fleet charging, and is an outcome of direct feedback from fleets on a key barrier to electrification: a lack of guaranteed access to charging infrastructure. Fleets need more than a baseline level of ubiquitous, widespread infrastructure deployment; they require guaranteed availability and uptime at charging sites. For many fleets, a first-come-first-served model of site access leaves doubt about the availability of charging infrastructure upon arrival at a site. This uncertainty around charging access prevents fleets from moving forward with electrification, which prevents the market from scaling. Fleets must deliver goods on a set schedule and cannot afford to wait for charging if a queue forms at a publicly accessible site.

Terawatt notes that the first movers to electrify will likely be large, well capitalized fleets who choose to integrate battery electric vehicles (BEVs) into their operations, as well as fleets who contract with shippers that are willing to pay a “green premium” for zero-emission goods movement. As well capitalized first movers, or those with a market incentive to adopt electric vehicles, these customers are willing to contract for guaranteed access to truck charging infrastructure, rather than relying on publicly available charging. These customers prefer to pay for charging using service agreements, or by leasing stalls or portions of a site. Customers can pay for a pre-reserved amount of charging over a period of time, or can pay as they use the infrastructure. Fully publicly accessible charging sites can supplement these shared depots as a form of “opportunity charging” while en-route.

These contracts are also crucial for developers of charging infrastructure to de-risk the development of a charging site. Demand for publicly accessible charging without the use of a contract is still very nascent, and following the retraction of the Advanced Clean Fleets (ACF) preemption waiver request, the type of fleet demand for charging will change significantly over the coming years. To cut through this uncertainty and continue the buildout of charging infrastructure to serve fleets, contractual rather than publicly available, pay-as-you-go charging gives charging infrastructure providers the demand signals that are necessary to justify building charging sites. While these first movers can de-risk a site to an extent, public investment is still required to bridge gaps in demand



and build the first phase of a mixed-application network of charging to meet fleet demand.

The benefits of the shared-depot model

The primary benefit of the shared-depot model is that it creates better infrastructure utilization outcomes than a publicly accessible site. Fleets receive guarantees with regard to availability of charging, and site operators get robust line-of-sight to charger utilization metrics. Operators can add additional fleet customers into a site's charging mix at levels that reduce costs for all users by mitigating demand charges. Demand is likely to be variable at a publicly accessible site where users access charging on an unscheduled basis. Instead, shared depot charging can be optimized as access is controlled and scheduled prior to arrival. Additionally, below a certain level of reasonably assumed utilization, a utility may not be able to devote sufficient power to a truck charging site that will be required to scale the site's operations over time. As already emphasized above, Terawatt recommends that the CEC treat site level utilization as the metric by which public investment is justified, as it indicates a valuable return on investment for public funding (as distinguished from the availability of ports, which may or may not ever be used).

In addition to the utilization benefits of the shared depot model, the model can also be a deciding enabler of a fleet's ability to electrify some or all of its operations. As it is preferential in comparison to a publicly available site (again, because of the business-critical need for consistent and reliable access to refueling in the freight sector), the shared depot model can drive greater adoption of electric trucks. In fact, it is probable that this model will make up a significant amount of the charging infrastructure utilization needed to support the state's transitioning fleets, compared to other models, including both private depot charging and in comparison with publicly available infrastructure. Terawatt views the shared depot model of charging as complimentary to publicly accessible charging sites, which best serve as en-route, opportunity charging locations for fleet users when needed to supplement charging at a depot location. By supporting the rapid electrification of trucks, optimization of charging schedules for maximum throughput, and competitive pricing, shared depots can deliver significant emissions reductions per site.

(2) How should the CEC plan for the state's future MDHD charging needs to both accommodate fleets that will need access to chargers while en route to a destination (similar to the diesel truck stop model where the ports are fully publicly accessible first-come-first-served) vs. fleets that need certainty that charging will be available and accessible when it comes time to charge (the reservation system model)?

Hybrid sites that offer both publicly accessible charging and "contracted capacity" are necessary to de-risk infrastructure investments, even with the addition of public funding. Additionally, reservation systems will need to be implemented for all sites, including fully public, hybrid, and shared-private facilities until charging times for heavy-duty vehicles

are similar to diesel fueling. As noted in a previous answer, without a reservation system, fleets may not be able to make deliveries on time, and queues to charge could form at existing charging stations that would back up onto highways or local arterial roadways causing safety issues.

(3) Is a reservation system for use of public chargers needed to meet the needs of the trucking industry?

Yes. During the early years of fleets' adoption of electric vehicles, the vast majority of charging sites will require a reservation system for access. This is also a preference among fleet customers who do not wish to arrive at a charging station to find all chargers already being used. Trucking is a low margin industry, and fleets cannot afford to wait for charging access and overall prefer to have guaranteed, reservable charging sessions that can align with their duty cycles. A delay to begin a charging session, which at present is already a larger period of "downtime" compared to diesel fueling, is a significant risk to trucking business models, and undermines the industry's trust in zero-emission refueling as a legitimate option to reduce vehicle TCO and on-road emissions. Reservation systems and gated entries are also necessary as a security measure to prevent cargo theft due to longer dwell times compared to diesel fueling.

(4) What reservation systems exist that could allow use by more than one trucking company?

Reservation systems are likely to differ across infrastructure providers and are highly proprietary. Infrastructure providers have invested in the development of these systems to optimize charging across a single network, competing to offer customers a better product in the process. Terawatt has developed a reservation system that is interoperable across Terawatt sites, but could not be integrated into the reservation system of another third party charging provider. Terawatt's reservation system is designed to be used by multiple fleet customers who are onboarded into the system prior to seeking a reservation. Reservations are key to guaranteeing customers high levels of uptime at sites.

(5) Does a "Trucking-as-a-Service" (TaaS) model in which trucks are leased and guaranteed chargers by a site operator provide enough public opportunities for trucks that are not leased through the site operator?

Terawatt does not offer a TaaS model and does not provide comments on this question.

(6) Should there be a certain percentage of chargers available to the public at all times? Should there be a certain percentage of chargers available for reservation at all times?

Broadly, the CEC should avoid instituting requirements around the percentage of a site's chargers that are available to the public or available for reservation at all times. This

requirement could limit the number of charging sessions that site operators can offer customers per day under a service contract or long-term stall reservation structure.

(7) What is the ideal reservation system or process for MDHD truck charging?

The functionality of a reservation system is dependent on the specific use case of charging provided by a site. Terawatt has developed a proprietary reservation system for fast charging sessions that manages customer demand and guarantees customers access to charging. Customers are added to Terawatt's reservation system prior to accessing a site, and can use the streamlined and user-friendly interface to reserve future reservations.

(8) If a portion of chargers must remain first-come-first-served, what ratio for reservation vs. first-come-first-served chargers would you recommend?

Terawatt recommends that reservation systems be implemented for all truck charging sites as a best practice in operations. Publicly available sites can leverage a reservation system that is publicly accessible, free to use, and does not grant preferential access to one customer over another. By making a reservation system available to the general public in a manner that does not provide preference to some customers over others, a reservation system does not impact whether a site is considered public or not public. In this case, the reservation system only serves as a means to communicate availability of charging to customers, in the same way that a driver pulling up to a site to find no available charging ports would experience without a reservation system. For this reason, reservation systems also improve site safety, as trucks would not be entering sites only to have to turn around and find another charging option.

(9) Which configuration would be preferred:

a. A site where all chargers can be reserved but can also be used on a first-come-first served basis if a charger is not reserved or in use?

b. A site where a portion of the chargers are reservation only and another portion first come-first-served only? In this configuration, is there an optimal percentage of chargers that are always available (not available for reservation)?

Neither of these configurations are preferred. A preferred configuration for public charging sites would be to have some chargers set aside for reservation using a publicly available reservation system, while others can be reserved using contractual fueling agreements for longer periods of time so that an anchor customer can improve the economics of the site for all users. An expanded explanation of how this configuration would work in practice is included in Terawatt's response to Question 1. The exact split between chargers that can be reserved for a single session versus a longer period of time is highly dependent on the site's location, demand for charging, and presence of an

anchor customer, and the CEC should defer to charging providers on a case-by-case basis when evaluating individual grant applications for award.

(10) If a truck is charging at a first-come-first-served charger at a site that also allows reservations, and a scheduled reservation arrives while the charger is still in use, what is the protocol?

A protocol in response to the proposed scenario is dependent on the reason why a truck remains in a charging stall that is reserved. If a truck remains in a charging stall after its reservation has lapsed, dwell time fees may be implemented to incentivize faster turnover of the charging stall. Reservations, especially those for contracted customers, must be honored, and a customer would be directed to a vacant charging stall. Terawatt does not envision this happening at its sites due to the use of a reservation system for all charging sessions.

(11) The CEC's Clean Transportation Program administers public funding, which must provide a benefit to the state. How does a project with a reservation system benefit the state of California?

Projects that leverage reservation systems provide immense benefits to the state of California. Primarily, a reservation system gives fleets more confidence in their decision to electrify their operations as they know there is optionality to guarantee access at a charging site before arrival. A reservation system, from Terawatt's perspective, is a basic requirement in the operation of a heavy-duty charging site, as it allows the site operator to assess demand and ensure that chargers are available prior to a customer arriving on the site. It is important to note that every truck charging session, whether at a public, shared, or a private site provides benefits to California by reducing emissions¹.

(12) Are there driver safety or equipment protection issues that the CEC must consider when determining whether a charger should be "public"? Could a charging site be open to the public without attendees on site?

Due to potential cargo theft, many sites - especially those in remote areas - will need to have an attendant on site. For overnight charging, gates and other cargo protection measures will need to be implemented. Implementing these measures is a standard practice at existing logistics facilities like railyards, intermodal transfer points, ports and truck parking facilities. These practices enhance the benefits to the general public (safe, efficient, reliable delivery of goods) and customer experience (employee safety, ability to honor contractual commitments to customers) associated with logistics facilities.

(13) Are there standardization or communication protocol issues that the CEC needs to consider when developing "public" / en route charging eligibility criteria for CEC funding opportunities?

¹ CALSTART: [Shared Charging Sites: Accelerating the ZEV Market and Delivering Public Benefits](#)

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Terawatt recommends that the CEC avoid instituting binary requirements around standardization as the industry is still nascent. Over time (similar to developments in the light-duty sector), market forces will drive standardization and the standard requirement of specific protocols will be justified.

(14) Please describe your optimal public charging network that is a mix of first-come-first-served and reservation systems throughout CA.

Terawatt works with customers to provide convenient, reliable charging infrastructure across multiple product offerings. Terawatt offers corridor charging, shared depot charging facilities, behind-the-fence, and built-to-suit installations that power fleets of all sizes. A mix of public, private, and shared access facilities will be required to meet the needs of electric fleets. While the exact makeup of the statewide network of charging stations for trucks will be determined by fleet demand, Terawatt expects the majority of charging sites to have elements of exclusivity, or be a hybrid public/shared site with exclusive or limited access to a portion of the site with some stalls available for public access using a reservation system.

(15) Please describe your optimal site configuration. It may be 100% first-come-first served, 100% reservation system, or a combination of the two.

See response to question #9.

(16) If using a reservation system, please describe your optimal set of rules and parameters of how a reservation system would work.

See response to question #7.

