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CLEAResult Energetics Comments

Pleased see the attached comments based on CR Energetics experience with EV Load Management as third party evaluators for California investor-owned utility transportation electrification programs

Additional submitted attachment is included below.

Docket # 24-FDAS-04

CLEAResult Energetics is pleased to offer this response to the California Energy Commission's RFI on *Flexible Demand and Load Shifting in California for Electric Vehicle Support Equipment.* Energetics has extensive experience working with various EV charging hardware and software vendors and end users for utility, state and Federal clients and would be eager for the opportunity to share more inform with Commission Staff. Please don't hesitate to reach out for further information.

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Introduction to Energetics

Energetics serves as part of a third party evaluation team for California investor owned utility transportation electrification programs. Energetics performs NSP (Network Service Provider) data collection as a third-party evaluator for multiple California utilities and has collectied NSP data from more than 50,000 active charging ports nationwide through the U.S. Department of Energy EV WATTS project.

Energetics is providing aggregated NSP data needed for the California Utility Transportation Electrification (TE) programs to meet the data reporting requirements for the California Public Utilities Commission's Energy Division. Through this process, we have seen only around 25% of more than 150 fleets (SRP) using load management, although more than 80% of the fleets have hardware and software that should allow some management . these finding are explore in some detail of the Grid Impacts sections of the CA IOU SB 350 Standard Review Projects and AB 1082/1083 Pilots Evaluation Report Link: srp-ab10821083-2023-evaluation-report112024.pdf

With this background we woffer responses to CEC questions

2. What is the current landscape of options for charging schedules that prioritize the driver experience, emissions reductions, financial savings, and/or other factors? Please provide information or data on customer receptiveness to various charging schedules, such as charge immediately, charge by departure, etc. and the entity who possesses such information.

Throughout 4 years of reporting on utility-sponsored EV charging projects and semiannual meetings with participating NSPs, CLEAResult Energetics has compiled the load management options for roughly 25 different networks. Distilled into simple categories, these are, from least-to-most complex:

- Charge immediately/no functionality: the standard implementation, generally maximizes driver experience at the cost of emissions, financial savings, and grid congestion.
- Simple post-peak/time-of-use scheduling (NSP time limitation): frequently bundles
- Programming in cost variables (energy/demand costs)
- Algorithmic power allocation/charge by departure

Additionally, ancillary factors that are not directly connected to charger hardware have proved important considerations in implementing charging schedules. Critical peak pricing, emergency load reduction programs, and utility-requested demand response programs all inform the overarching landscape for altering charging schedules to balance grid congestion, emissions, and driver experience.

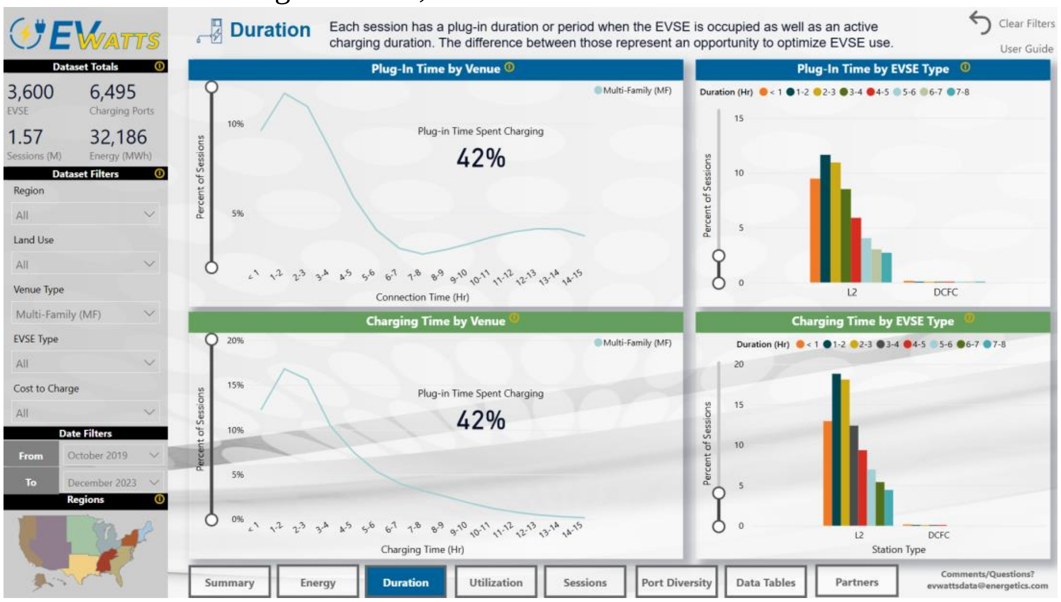
3. Please comment on the various EVs or EVSE consumer charging preferences such as charge immediately or "charge by departure", where the EV is charged to a specified percentage with a set time to be ready.

a. How does using charge strategy balance factors as battery life, price, etc.?

- An ideal charging strategy is inexpensive, reliable, and supplies an appropriate amount of power for the amount of time the vehicle spends charging. Maximum power delivery may have impacts on battery lifespan, but may be required with short charging opportunities or large batteries.
- Commercial medium and heavy duty vehicles tend to not be as sophisticated as light-duty vehicles in setting limits on SoC. For example, while many light-duty vehicles are able to sense when their SoC reaches a target and end charging at that point, very few commercial vehicles have the ability to mimic that behavior.
- Of the fleets examined across the evaluation year 2023 standard-review projects report, 28 of 135 activated sites (~20%) of them appear to use load management, generally characterized by sharp increases in demand after 9 p.m., when the peak-rate period ends. We find that fleet operators focus primarily on ensuring reliable daily operations by any necessary means. However, we also find that subsequent years of operation are more likely to see load management, as well as national fleets which have the benefit of ancillary/alternative sites as opposed to smaller fleets with fewer sites.

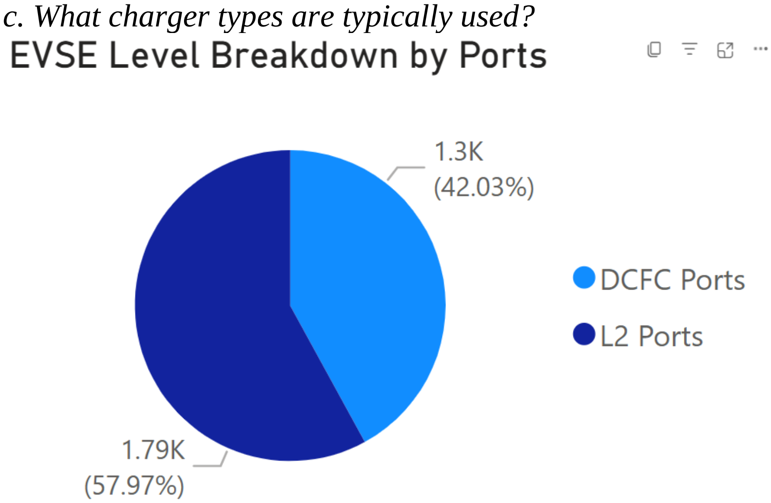
b. What consumer data is available that provides customer charging habits such as: demographics and population percentages that prefer to charge at home, at work, or in public shared spaces? What times of day?

- CLEAResult Energetics' EVWatts project is an excellent, publicly available resource to examine these segments of the EV-driving populations. Dashboards are available to illustrate the charging habits at home, workplace, and public shared spaces, and are broken out for higher granularity at the "venue type" level for increased segmentation, if desired.



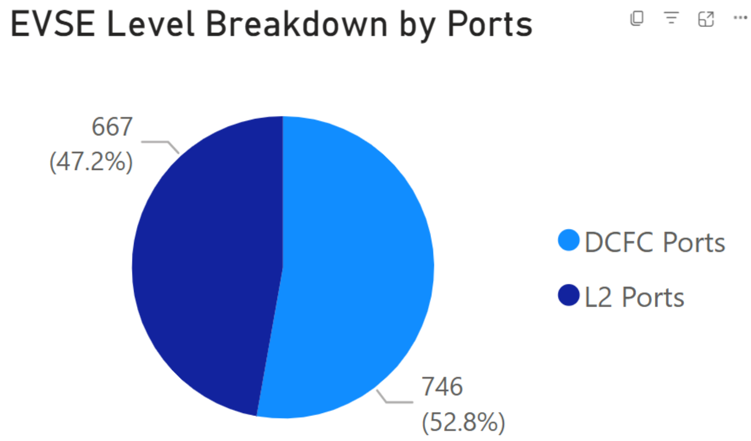
- The SRP report additionally covers some sites installed in each of the four main IOUs' territories at schools and parks – in each territory, schools represent a mixture of work and public shared space charging, and parks are generally purely public shared space with some potential for "home" charging from nearby residences. Average load curves and graphs of the daily energy dispensed across all sites are available within the SRP report.

c. What charger types are typically used?



As seen in the CLEAResult Energetics SRP internal dashboard, splits between L2/DCFC across the entire program broadly favor Level 2 ports (58%) over DCFC

(42%). However, more fleets seem biased toward DCFC recently (EY 2022-2023), as seen within the Site Visits section of each utility's SRP program's year-over-year port count graph and the following screenshot from the internal dashboard.



d. *How do charging patterns change as EV owners gain experience with their vehicle?*

- Through the SRP program, we see that small numbers of managers opt into load management in subsequent years. Multiple factors may drive this, including a larger interest in LCFS credit capture; a desire to avoid high-cost demand charges; or simple awareness of the possibility of automated load management. Additionally, as discussed in the next question, we tend to see larger charging sessions as fleet drivers and operators begin to grow more comfortable with the limits and capabilities of their vehicles.

e. What percentage of battery capacity is typically charged per session?

- Through the SRP program, CLEAResult Energetics has observed that the per-ression battery SoC regained tends to start smaller (<50% SOC), then ramps as confidence grows, to ~80% SOC. Very few ops/fleets regularly charge >80% of their battery per session. Some market segments (e.g. transit, school bus) utilize smaller session charge percentages but charge multiple times per day due to more availability. Please see SRP fleet reporting for illustrations of battery capacity versus daily consumption.

5. What software and hardware capabilities could enable public EVSEs to relieve/eliminate grid congestion at the Distribution (referring to Transmission and Distribution, T&D, for the grid) level? What control strategies are available to the grid operator and/or load aggregator to shift and/or curtail demand from EVSEs at the Distribution level to maintain grid reliability?

- The CEC could examine the Emergency Load Reduction Program (ELRP) – Some fleets and workplace EVSE were set to automatically respond to utility signals to reduce load during this event, although many other participate based on receiving manual notification of events.

- TOU rates being delivered to retail drivers are just as important as the hardware and software capabilities, as pricing tends to be a primary driver of behavior shifting among public EVSEs.
- SDG&E's Power Your Drive program (pilot + extension) contains hourly-variable pricing that allows drivers to pick and choose when to charge during long dwell time during work + residential. Results can be seen in Energetics' PYD report. DG&E FINAL Power Your Drive Research Report April 2021

9. How can medium-duty and heavy-duty (MDHD) EVs and their EVSE fit into the CEC's goal of load shifting to avoid GHG emissions?

- As CLEAResult Energetics has seen in multiple areas of their long-running SRP project being conducted across all four major investor-owned utility territories, there is innate flexibility built into vehicle operations, though the exact magnitude of this flexibility is highly operations-dependent. Vehicles commonly charge into expensive, high-emissions hours of the day, driven by tight schedules, and a need to charge batteries to meet vehicle duty cycle requirements, though in other cases fleet managers require additional time to build familiarity with operations before enabling load management, or simply do not have the resources to devote to load management. Standardizing a system or mechanism to automatically detect and adapt power delivery to match fleet schedules and avoid high-GHG energy periods (along with the ability to override this in urgent situations) may be useful in accessing that flexibility in a low-impact manner, as seen in products such as smart thermostats.
- Each fleet utility section in the SRP report discusses the flexibility of the utility's participating fleets, frequently calling out school buses as a unique case for load-shifting, and have quantified the exact amount of flexibility and potential GHG and cost reductions.

10.Should the scope of this regulation include load shifting criteria for EVs such as forklifts, boats, and other off-road vehicles? Do off-road vehicles typically have a defined use-cycle that fits the need for load shifting? If so, which types of offroad vehicles? Please provide off-road EV counts, types of EVSE for off-road EVs, and charging strategies for off-road EVs.

CLEAResult Energetics believes that load shifting may be minimal among off-road vehicles, as these are often multi-shift operations adhering to near-24-hour usage, providing less opportunity to shift energy due to ongoing operations and minimal, strictly-scheduled downtime.

12. What are the charging practices for commercial fleets? Bus fleets? Overnight depot level charging? What power levels? How is the charging of the fleet managed? Manually rotated? Management software?

- Based on the experience of SRP fleets, we see lots of overnight depot charging at 30-90kW, some as high as 200+kW. Charging seems to be heavily software-managed, with some manual rotation when vehicles outnumber ports, or manual initiation (someone shows up @ 9PM to plug in buses) scattered throughout. Some large drayage fleets rotate trucks in an out during the day, with drivers picking up fully charged vehicles to complete their shift. Level 2 charging was put into place by many earlier fleets, but offers less flexibility to shift charging times when 8-10 hours may be needed for a full charge.

15. Can a load shift program work with EVSEs/EVs responding to generic signals, or must signals be tailored for each EVSE/EV?

- EVs have a hard time communicating with EVSEs due to a lack of strict standardization and de-synchronized updates. Generic signals can likely work *if they are strictly homogenized* and adopted uniformly by all stakeholders in the charging "supply" chain.
- Certain MD/HD vehicles "fall asleep" if they do not draw current for a set amount of time, rendering them unable to reinitiate charging at appropriate times and some networks and fleets have ID'ed circumventing this with minimal charging demand to stay awake.

16. What data or information is needed from the EV and/or EVSE to enable load shift while ensuring driver mobility and range needs are not compromised (for example, kWh needed by the vehicle)? How could this data or information be communicated across all vehicle and supply equipment models, regardless of the manufacturers' involvement?

There are a number of data fields that would be required to managed load shifting and are useful in evaluating its potential. Although some of the fields relate to standard commands outlined by OCCP or ISO 15118, many different vendors have slightly different implementations of these fields. User input or linkages through telematics are often necessary because vehicles and chargers cannot communicate all the information needed to confidentially load shift. Some of these fields are:

- Fleet plug-in, plug-out times
- Fleet power draw start and end times
- Time of departure
- SoC needed at departure
- Prioritization of charge
- V2G availability

- Vehicle SoC (constantly reported)
- Utility rate time blocks (manually set/automatically pulled)

17. What is the energy consumption impact from adding flexible demand capability to existing EVSE?
CLEAResult Energetics has characterized parasitic/standby load for >25 pieces of hardware, and deems this to be relatively similar between non-load-managed and load-managed chargers and do not expect this small difference to increase. However, there is a significant difference between standby loads for DCFC and L2 chargers.
20. Are there any considerations to ensure equity when developing a load shifting strategy for supplying energy to electric vehicles? For example, are there concerns that flexible demand will be disproportionately accessible based on income level?
A key component of ensuring equity in load shifting will be to clearly and directly communicate retail energy rates to drivers who arrive to charge. The CEC should continue to question whether retail rates accurately reflect daily renewable energy trends. Understanding the rates that charging stations charge to drivers will be critical, and may require careful management to ensure that prices account for cost-of-living variance within cities and communities. CLEAResult Energetics' SRP rate analysis notes that, in terms of nominal rates to drivers, commercial/public EVSEs tend to be highest, followed by MUD chargers, then finally single-family homes. Ultimately, the most pressing question for the CEC will be: how can the industry install and maintain low-cost charging for non-SFH?