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**Ample Comment on revised CEC 2024-2025 Investment Plan
Update for the Clean Transportation Program**

Additional submitted attachment is included below.

From: Dr. Levi Tillemann (VP for Policy and International Outreach, Ample Inc.),
Matthew McGovern (Policy Counsel, Ample, Inc.)

To: California Energy Commission

Date: October 21, 2024

Re: Revised Staff Draft Report - 2024-2025 Investment Plan Update for the
Clean Transportation Program (Docket ALT-24-01)

Ample appreciates the opportunity to comment on the Revised Draft Staff Report 2024-2025 Investment Plan Update for the Clean Transportation Program. Ample previously commented on CEC's 2024–2025 Investment Plan Update for the Clean Transportation Program. Ample is submitting this new comment to bring the Commission up to date on recent developments in international EV markets and technology.

We urge the Commission to adopt global best practices with respect to investments in EV infrastructure and to ensure that, as a general rule, funding opportunities are technology neutral. Specifically, we urge the Commission to ensure that funding programs do not, inadvertently or deliberately, exclude battery swapping.

Background on Ample

Ample provides modular battery swapping services to fleet customers. The company manufactures all of the major components used in its battery swapping system (battery modules, battery packs, and swapping stations) in Brisbane (California) and South San Francisco. Ample's Brisbane plant is supported by a \$14.7 million grant from the California Energy Commission which was awarded on May 10, 2023.

Ample's swapping system repowers EVs faster than conventional DC fast-charging at a price lower than fast charging. The company has deployed a fleet of swap-enabled Nissan Leafs and Kia Niro EVs in the San Francisco Bay Area in partnership with Uber and the rideshare rental car company Sally. Ample is currently adding more swapping stations and swap-enabled EVs in the Bay Area as well as European and Asian markets (notably Spain and Japan).

Ample has become very familiar with CEC's grant programs in recent years. Besides the successful grant application awarded in 2023, Ample has submitted three other applications, and carefully reviews all CEC GFOs to determine whether Ample should apply.

Light-duty electrification GFOs should explicitly include battery swapping

Ample appreciates the technology-neutral criteria CEC has included in several recent GFOs. For example, the RDWDS GFO-22-609 included a funding lane for EV charging hardware and software providers which was technology neutral as it did not stipulate specific connector types



or power levels. Similarly, the GFO-22-615 for medium and heavy-duty vehicle charging solicitation made an explicit effort to embrace technology neutrality and provided examples of eligible technologies:

[E]lectric vehicle (EV) charging applications, including, but not limited to the following: innovative business models (e.g., truck parking, truck stops/charging hubs, charging corridors, and mobility/charging-as-a-service); and innovative technologies (e.g., large scale ultra-fast charging, interoperability, battery swapping, fuel-cell powered EV charging, wireless charging, inductive charging, overhead catenary, and vehicle-to-everything (V2X) technology)¹

The inclusion of examples is especially useful to potential applicants as they decide whether to devote the time and resources required to submit an application. Awarding points for “replac[ing] gasoline vehicle mileage” in the scoring system for the FAST GFO-22-611 is another example of technology neutral criteria that encourages pollution reduction.²

Other GFOs have, perhaps unintentionally, stymied innovative solutions by embracing highly prescriptive criteria. We believe this is a mistake, as policymakers do not know which technologies will work best to expand electrification beyond early adopters.

Battery Swapping Continues to Grow Rapidly in China and Europe

In China (which is the world’s largest auto market, and hosts over 80% of the world’s public DC fast chargers) the market for battery swapping EVs is growing rapidly. Many major OEMs in China now have battery swapping solutions for repowering electric vehicles – which has allowed them to push past EV early adopters who rely on at-home charging. China’s two largest light duty battery swapping ecosystems are led by NIO and Aulton. NIO makes luxury EVs and shipped 57,000 vehicles in the second quarter of 2024.³ (Four other Chinese OEMs have opted into Nio’s battery swapping standards.) Aulton focuses on taxi and rideshare fleets.⁴

¹ GFO-22-615 Innovative Charging Solutions for Medium and Heavy Duty Vehicles Application Manual p. 5
<https://www.energy.ca.gov/solicitations/2023-05/gfo-22-615-innovative-charging-solutions-medium-and-heavy-duty-electric> (accessed June 18, 2024).

² GFO-22-611 FAST Application Manual, p. 37
<https://www.energy.ca.gov/solicitations/2023-04/gfo-22-611-fast-fast-and-available-charging-all-californians> (accessed June 18, 2024).

³ China’s Nio Defies EV Slowdown as Sales Nearly Double, Chunying Zhang, Bloomberg, September 5, 2024
<https://www.bloomberg.com/news/articles/2024-09-05/nio-posts-smaller-than-expected-loss-as-sales-nearly-double?embedded-checkout=true> (accessed October 3, 2024)>

⁴ China’s Nio to expand battery swap services to gain an edge on EV infrastructure, Evelyn Cheng, CNBC, April 5, 2024
<https://www.cnbc.com/2024/04/05/chinas-nio-to-expand-battery-swap-services-to-gain-ev-infra-edge.html> (accessed October 3, 2024).



Aulton announced that as of November, 2023, it had completed 83 million battery swaps to date, reducing carbon pollution by 940,000 tons.⁵ NIO claims that it has installed 2,427 swapping stations in China and five European countries and that these stations collectively provide 68,000 swaps per day.⁶ Battery swapping and China's long-term strategic support for its EV industry have helped BEVs reach a 26% market share for the first three months of 2024.⁷ (This compares to only 7.3% market share for EVs in the US during Q1 of 2024.⁸) And in July of 2024, plug-in electric vehicles accounted for over 50% of light duty vehicle sales in China.⁹

Battery swapping for medium and heavy-duty vehicles is also growing rapidly in China. According to Bloomberg New Energy Finance:

"Many of these trucks are operating in industrial sites, port warehouses, mines and steelmaking factories. Lighter commercial vehicles with swappable batteries also are being used in urban deliveries, an area where BNEF expects to see more growth as better economics and tightened emission requirements draw more attention to electric models."¹⁰

Japan has adopted the world's strongest battery swapping incentives

Japan is promoting battery swapping as a solution for electrifying commercial fleet vehicles. On July 30, 2024, Japan's Ministry of Environment (MOE) announced generous subsidies for EV battery swapping stations and swap-enabled EVs as part of its Commercial Vehicle Electrification Promotion Project (Trucks).¹¹ The incentive funds half the cost of EV battery swapping stations, half the cost of additional EV batteries for swapping, and ⅓ of the

⁵ Aulton website, <https://www.aulton.com/index.php/en/list-4.html> (accessed June 14, 2024).

⁶ *Nio provides average of 68,084 battery swap services per day in May*, Lei Kang, CNEV Post, June 4, 2024 <https://cnevpost.com/2024/06/04/nio-average-68084-battery-swaps-per-day-may-2024/> (accessed June 14, 2024); *Nio reaches 30 Power Swap Stations in Europe and over 2,200 worldwide*, Natalie Middleton, Fleetworld, January 2024 <https://fleetworld.co.uk/nio-reaches-30-power-swap-stations-in-europe-and-over-2200-worldwide/> (accessed October 3, 2024).

⁷ *BYD dominates China's EV market as price cuts take effect*, Autovista 24, May 3, 2024 <https://autovista24.autovistagroup.com/news/byd-dominates-chinas-ev-market-as-price-cuts-take-effect/#:~:text=In%20the%20first%20three%20months,a%20market%20share%20above%2040%25.> (accessed October 3, 2024).

⁸ *EV Sales Growth Slows; Market Leader Tesla Stalls*, Cox Automotive, April 11, 2024 <https://www.coxautoinc.com/market-insights/q1-2024-ev-sales/#:~:text=In%20the%20first%20quarter%20of,growth%20rate%20has%20slowed%20notably.> (accessed October 3, 2024).

⁹ *Most car sales (51%) in China are now plug-ins*, *China EV Sales Report July 2024*, Jose Pontes, Cleantechnica, <https://cleantechnica.com/2024/09/01/most-car-sales-51-in-china-are-now-plug-ins-full-report/#:~:text=Share%2Dwise%2C%20July%20saw%20plugin.should%20end%20at%20around%2050%25.> (accessed September 6, 2024).

¹⁰ *China's Clean-Truck Surprise Defies the EV Slowdown Narrative*, BNEF, Colin McKerracher, March 12, 2024 <https://about.bnef.com/blog/chinas-clean-truck-surprise-defies-the-ev-slowdown-narrative/> (accessed June 18, 2024).

¹¹ Implementation Guidelines for the Commercial Vehicle Electrification Promotion Project (Trucks), MOE July 30, 2024 <https://www.levo.or.jp/subsidy/hoseiyosan/kaizou/> (accessed August 30, 2024).



incremental cost of a swappable EV compared to an ICE vehicle.¹² Ample is currently deploying battery swapping stations in Tokyo in partnership with Daimler Trucks, Mitsubishi Corporation, and Yamato Transport, the largest delivery service in Japan. This follows a successful pilot deployment in Kyoto earlier this year.

Spain's Moves Singulares II program funds innovative EV repowering projects

In 2022, the government of Spain made €264 million available for innovative electric mobility infrastructure projects, including battery swapping, through its Moves Singulares II solicitation.¹³ Ample was awarded a roughly €10 million grant for deploying battery swapping systems in partnership with Stellantis and its Free2Move car-sharing service. The project is putting swap-enabled Fiat 500e's on the road in Madrid, which helps meet local electrification mandates and broader climate goals.

To the extent possible, CEC funding should be technology neutral

Recent studies support the cost effectiveness of battery swapping compared to other decarbonization technologies. For example, a 2023 peer-reviewed study comparing the systemic costs of decarbonizing ground transportation via different technology pathways (conventional EV charging, battery swapping, and hydrogen) found that battery swapping achieved the lowest total cost.¹⁴ We believe that battery swapping is, in many ways, a superior alternative to hydrogen and fast charging in light duty and many medium and heavy duty vehicles. We encourage CEC to adopt policies that allow battery swapping to compete with hydrogen and fast charging on a level playing field.

CEC's continued prioritization of hydrogen in the light duty space stands out as an area for improvement. California law requires CEC's Clean Transportation Program to spend a minimum of \$15 million per year on hydrogen through 2030. In the draft plan, CEC staff recommended spending an additional \$34 million (from a canceled agreement with Shell) on hydrogen infrastructure, which could include new or existing light-duty vehicle hydrogen stations.¹⁵

According to the revised staff report,

¹² Implementation Guidelines for Commercial Vehicle Electrification Promotion Project (Trucks), Reiwa 5 year 5 month 16 環水大自発 No. 2305161 correction Order and 6 year 2 month 16 環水大毛発 No. 2402165 correction 令和 6 year 7 month 19 環水大毛発 No. 2407192 [add link]

¹³ MOVES Grants Program for Unique Projects II (Second Call)
<https://sede.idae.gob.es/tramites-servicios/programa-de-ayudas-moves-proyectos-singulares-ii-segunda-convocatoria> (accessed October 3, 2024).

¹⁴ AM Valleria, *The Transition: Why we need battery swapping for the future energy and transport systems*, University of Lisbon, Faculty of Sciences, Instituto Dom Luiz, Lisbon, Portugal, 2023, ISBN 978-972-9348-25-9, <https://doi.org/10.56526/10451/55274>

¹⁵ *Draft Staff Report: 2024–2025 Investment Plan Update for the Clean Transportation Program*, p. 29-30
<https://www.energy.ca.gov/publications/2024/2024-2025-investment-plan-update-clean-transportation-program> (accessed June 18, 2024).



The CEC may use these funds to build new light-duty hydrogen stations; however, developers have been cautious in the face of inflationary pressures and market uncertainties. As a result, the prior hydrogen station funding solicitation GFO-22-607 was undersubscribed. Depending on market demand and progress on completing projects from the hydrogen solicitation GFO-19-602, the CEC may invest the unexpired funds in other projects that are not specific to light-duty hydrogen refueling stations.

Revised Staff Draft Report - 2024-2025 Investment Plan Update for the Clean Transportation Program, p. 50-51. Ample recommends that CEC allocate the unexpired funds to technology-neutral grant programs promoting innovative zero-emission technologies including battery swapping.

Conclusion

Ample is encouraged by the fact that CEC has opened many recent solicitations to battery swapping. We are looking forward to working with the CEC to help California meet its climate goals by decarbonizing transportation, beginning with California's fleets. Ample encourages CEC to design technology-neutral funding opportunities for clean vehicle infrastructure. It is critically important that the industry be incentivized to develop technologies which can repower clean vehicles as quickly as a gas pump. Setting that target and allowing for robust competition among diverse technology pathways (e.g. fast charging, battery swapping, or other clean technologies) gives California the best chance of achieving the state's decarbonization goals.