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CALSTART Comments to Docket #17-IEPR-01: Integrated Energy Policy Report, General/Scope; Publicly Owned Utilities Integrated Resource Plans

Additional submitted attachment is included below.

May 19, 2017

CALSTART Comments to Docket #17-IEPR-01: Integrated Energy Policy Report, General/Scope; Publicly Owned Utilities Integrated Resource Plans

CALSTART would like to provide the following comments on Docket 17-IEPR-01. Some of these comments and observations were provided as part of the Lead Commissioner Workshop on Publicly Owned Utility Integrated Resource Plans Transportation Electrification, Medium- and Heavy-Duty Vehicles Sector on April 27, 2017. Aligned comments were also provided to the 17-EPIC-01 docket.

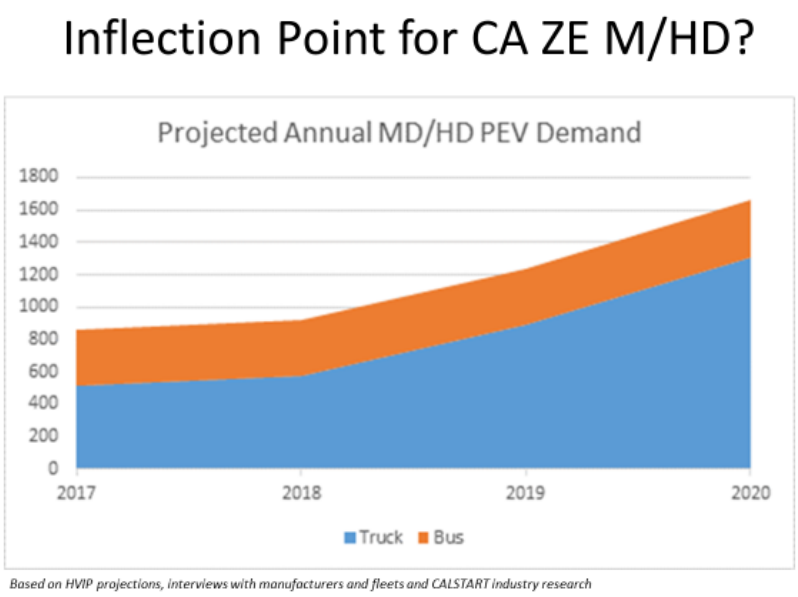
Our comments will touch on two core issues: the accelerating pace of transportation electrification for medium- and heavy-duty vehicles (MHDVs) and the urgent need for more a comprehensive needs assessment of this emerging demand; and supporting comments around other California Energy Commission activities which could support the growth of transportation electrification for MHDVs.

CALSTART believes the timing is crucial to conduct a needs assessment of the electrical grid to understand how well it will be able to integrate electric medium- and heavy-duty vehicles (MHDEVs). Given the recent advancements in technology, along with proposed investor-owned utility combined investments totaling $1 billion in transportation electrification, most of it concentrated on MHDEVs, the timing of such an assessment is critically important to the success of wide spread transportation electrification.

As you will see from these comments, we are concerned that the pace of planning and readiness is falling behind the pace of deployment we see happening and what we are projecting in the coming few years. Conducting a needs, load and locational assessment to understand where the grid will face spikes in load from MHDEVs will not only better inform CEC's planning decisions, but will also help manage grid impacts from MHDEVs while also making the grid more accessible to this new and innovative technology. Our comments below provide our analysis of why we see this as a much-needed investment now.

Accelerating Pace of ZE Deployments

Zero emission electric drive medium and heavy-duty vehicles are coming to the market faster than anticipated. Following a slow introduction period in 2011-2014, the volumes in the past two years have shown a marked upward trend, led by battery electric transit buses and shuttle buses. Most recently, based on voucher requests logged and tracked in the California Air Resources Board's (CARB) Hybrid and Zero Emissions Truck and Bus Voucher Incentive Program (HVIP), the market has expanded even more quickly with new introductions of medium-duty electric trucks in the urban delivery and work truck segments. Currently, while electric bus purchases remain high and growing, they are being overtaken by growth in electric truck orders.

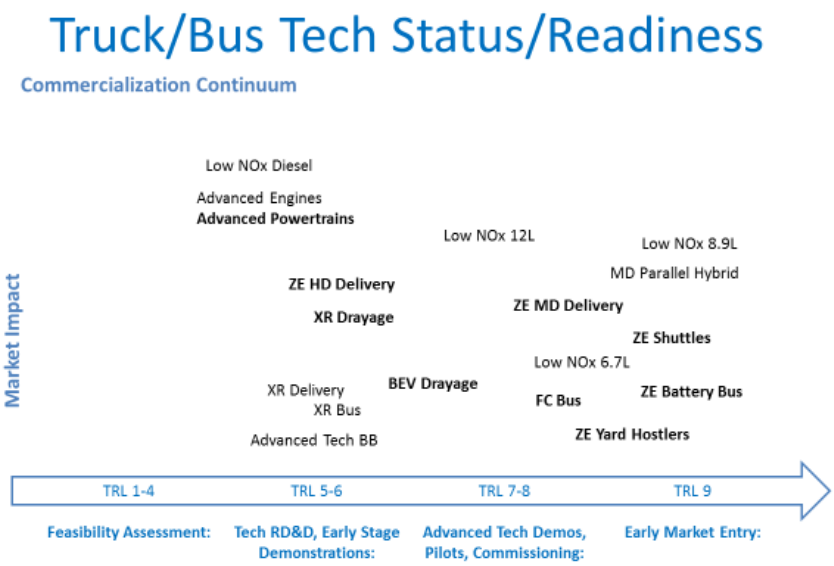


Based on market projections performed by CALSTART, which serves as the Administrator of HVIP, this growth will show a marked upward inflection point in 2018 driven mostly by truck vouchers. Nonetheless, bus purchases remain strong. Interestingly, currently half of electric transit bus orders are not going to traditional transit properties, but instead to commercial and college campus environments.[1]

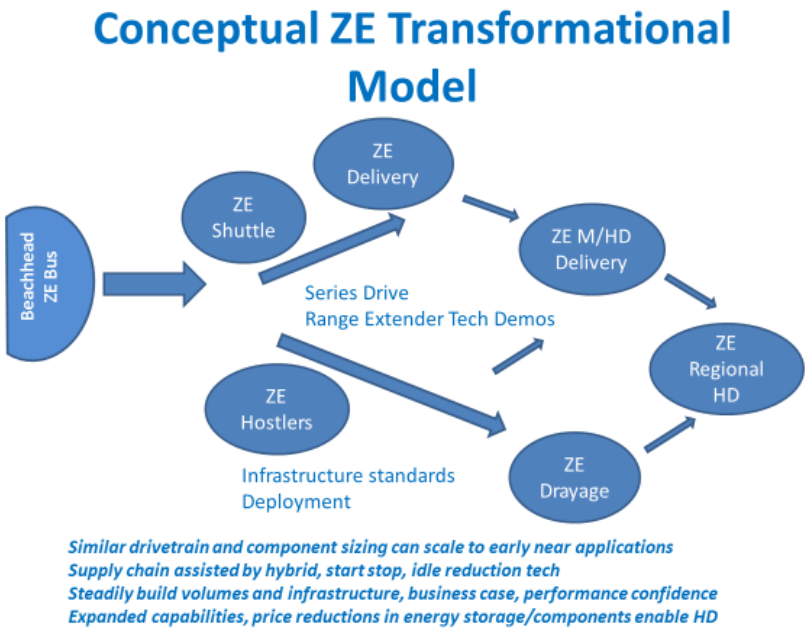
[1] HVIP market projections based on HVIP market trends, interviews with manufacturers and fleets and CALSTART industry research

Tech Status – Moving to Market.

The reasons for this expansion of product and sales are many, but are tied to the steady improvement of electric driveline systems, the steep and steady reductions in energy storage costs, the improved capitalization and performance of vehicle manufacturers and the validation of operations and business case in the first success markets, notably transit buses. CALSTART has been performing technology readiness assessments of the low emission and medium- and heavy-duty electric vehicle (MHDEV) space, using generalized technology readiness levels (TRLs) as a tool to measure relative progress toward the market. Several categories of vehicles are now moving through the commercialization process and poised to follow the transit bus success, notably shuttle and urban delivery vehicles, as well as yard hostlers (also known as terminal tractors). Several more categories are in the demonstration and pilot stages, including fuel cell electric transit and extended range electric vehicles. This vibrant development channel gives additional confidence that the market will continue to grow as these platforms reach market stage.



The commercial readiness indicated above is following this pathway for a reason: it is a reflection of the step-by-step phased introduction of MHDEVs over time as new application segments become viable. Understanding this transformation process is a critical factor for effective infrastructure planning. It has signficant bearing on the timing, location and charging rate demand of electric infrastructure that will be needed. CALSTART, working with manufacturers, suppliers and CARB is developing a framework model for anticipating these introductions. We have first identified "beachheads" for the introduction of MHDEV technology.

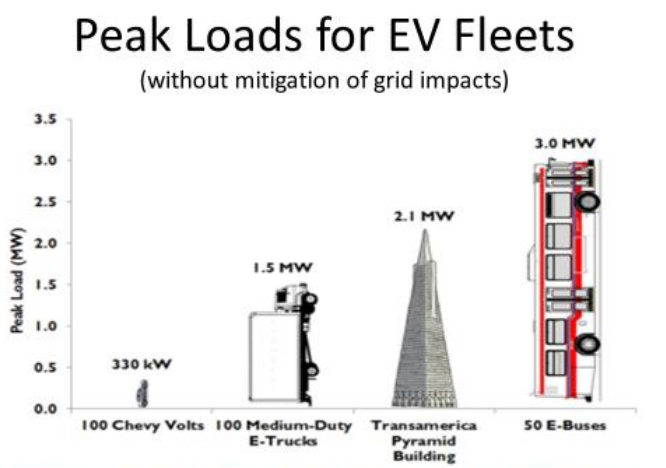


These beachheads serve as the first success markets for a technology's broad use. From these first markets, additional market expansion becomes possible to applications with comparable performance needs, where components and systems can be shared and/or scaled and transferred. In the electric drive pathway, battery electric transit buses have served as the beachhead.

As their volumes have increased and costs have begun to drop, the technology has extended to circulator shuttle buses, and then into delivery vehicles, from step vans to "box" trucks. Zero emisions yard hostlers have similar enough electric motor and power needs that transferring the technology to this application is proceeding next. Eventually, this scaling and transferring can allow additional markets and new applications to be addressed and build out a broad based deployment.

By extension, this has a strong bearing on planning for grid impacts and how to mitigate them. Not only will the vehicles be arriving in the market in successive waves by weight, duty cycle and applications, these vehicles have very different charging needs and dynamics. Most importantly, they have much greater locational impacts than light duty (passenger car) electric vehicles. A fleet of 50 electric buses can have a potentially greater demand – when charging – than a large commercial skyscraper.[2] However, while much work has been performed to plan for and address light duty electric vehicle infrastructure deployment, there is a

[2] Electric Truck and Bus Grid Integration: Opportunities, Challenges, Recommendations http://www.calstart.org/Libraries/Publications/Electric_Truck_Bus_Grid_Integration_Opportunities_Challenges_Recommendations.sflb.ashx



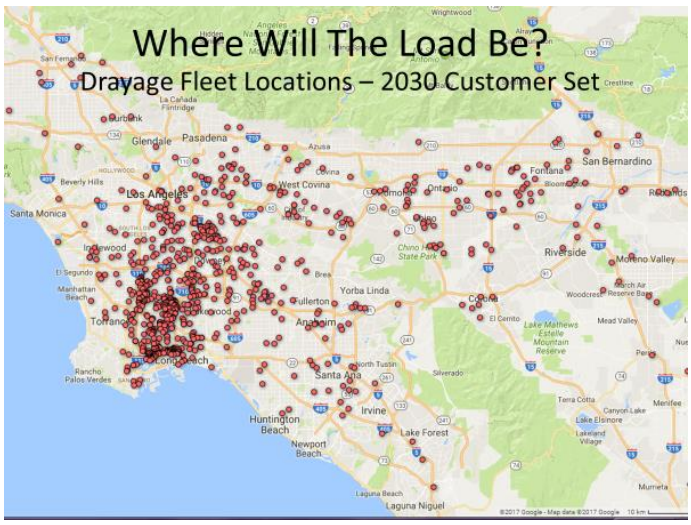
From: Electric Truck and Bus Grid Integration: Opportunities, Challenges, Recommendations
http://www.calstart.org/Libraries/Publications/Electric_Truck_Bus_Grid_Integration_Opportunities_Challenges_Recommendations.sflb.ashx

gap of knowledge on timing and impacts for the MHDEV segment. As a result, we are at risk of falling behind the introduction curve of these vehicles. This is particularly salient as the investor owned electric utilities are beginning their initial MHDEV rate case proceedings with the California Public Utilities Commission as directed by SB 350. They and the core regions in question could benefit from more granular assessments of when, where and how much infrastructure to prepare for, and what the impact of that load demand will be. MHDEV loads will be larger than previously experienced for light duty vehicles.

Impacts: LD vs M/HD

Light Duty	Medium Duty	Heavy Duty
Level 1: <3.6 kw Level 2: 3.6-20 kw DC Fast: 50-80 kw	Level 2: 20 kw High Rate – 20-50 kw	High Rate – 50-80 kw HD High Rate – 250-350 kw
Battery Pack Sizes 12-80 kwh	Battery Pack Sizes 60-120 kwh	Battery Pack Sizes 60-600 kwh
Charging: Home, work or destination	Charging: Central fleet domicile; route recharging possible	Charging: Central fleet domicile; route opportunity charging
Small clusters of vehicles	5-100 vehicles	5-200+ vehicles
3.6 – 20 kw demand	100 - 5,000 kw demand	250 – 50,000 kw demand

They will also be placed in locations not previously considered for EV infrastructure. As opposed to domestic residences, office locations and destinations such as shopping centers, MHDEV infrastructure will need to go where the trucks and buses are housed for their work. While for the bus industry these can be discretely planned – transit bus yards – the locations for circulator buses and delivery vehicles are in very dispersed locations. As the market extends and expands to heavier regional distribution and work vehicles, there will be no overlay match between high load locations for MHDEV charging and that which was planned for light duty.



Two examples make this case for the Southern California region. The first chart shows locations of fleets that have utilized HVIP vouchers for hybrid and electric purchases to date, and who would be considered likely adoptors of additional vehicles. This overlay map gives an idea of medium-duty delivery and work truck locations of 1- 40 vehicles per location. However, once even heavier platforms are electrified, possibly starting in the 2020-2025 timeframe, the distribution is completely different and the charge rates significantly higher. The second map shows locations of selected drayage truck domiciles for the Southern California region, each with from just a handfull to several hundred trucks. If we do not start planning for that need, which is one of the transformational goals needed to achieve California sustainable freight, climate reductions and possible criteria emission reduction goals, we will not be prepared for this load nor know how to mitigate it.

So in summary, the current situation is:

- Zero Emission electric drive medium and heavy-duty vehicles are coming to the market faster than anticipated.
- They will phase-in over time in sequences that are based on tech viability, duty cycle and emerging business case and it will not be a smooth or even in roll-out.
- MHDEV impacts on the grid are at much higher demand levels and very different locations than planned for light duty EVs.
- Distribution capacity, demand mitigation and load management are important issues

  - In addition, there is also a hydrogen and possibly a natural gas overlay to this because of range extended electric drive architectures.

- To prepare for this growth we need to initiate vehicle timing, distribution and load demand studies and planning now.

CALSTART believes California Energy Commission programmatic funding needs to be directed to study and resolve these issues:

- Assess MHDEV Market Penetration Timeline, Phases and Volumes by Segmentation (vehicle class, duty cycle, daily routing)
- Determine Charging and Load Demands by Segmentation/Timing (which vary greatly by performance, work needs)
- Determine Locations of Potential Expected Demand Over Time (domiciles of likely customers, route and facility opportunity charging)
- Outline planning strategies and timing to deploy, support and mitigate impacts

Additional Comments – Other CEC Actions to Support Transportation Electrification in MHDVs

At the workshop, we raised the observation that utilities needed to be encouraged and supported to engage in "creative meddling" to provide assistance to fleets adopting electric drive MHDVs. We cited as example the innovative CPUC filing by Southern California Edison, with its suspension of demand charges for commercial electric vehicles for a period of five years to provide a period of learning for fleets. We also cited the creative work underway at the Los Angeles Department of Water and Power (LADWP) to respond quickly to fleets, creatively adapt funding and assistance plans for infrastructure installation, and by extension gain a greater understanding of user and manufacturer needs and utility impacts.

Similarly, we would strongly encourage the California Energy Commission, via the IEPR process and in influence of its multiple programs, to engage in this same "create meddling" to flexibly try multiple methods of speeding MHDV electrification.

Two specific recommendations are provided, but they are in no way exhaustive.

First, we strongly encourage the CEC to begin consciously planning to find and site multiple-use electric fast charging and hydrogen refueling stations. In other words, these would be selected stations able to accommodate in one station location both passenger car and commercial vehicle needs. This has been a highly successful model for the natural gas industry for years. Particularly for hydrogen, where the business model for a station owner is predicated on "throughput", such stations may become a requirement. Such accommodation of commercial vehicles need not be expensive or difficult, but it requires conscious planning. They must

be able to physically, via their site design, allow for ingress and egress of commercial sized MHDV platforms. They must also, via their capacity, enable both commercial and passenger car refueling/recharging. This means adequate power levels and/or on-site storage. Interestingly, current power levels for passenger car fast charging (DC fast charge) may fall in the range needed by MHDVs, at least for some applications.

Second, we would urge the ARFVTP to consider additional allowable uses for its program that provides funds for manufacturing sites. One of the barriers for the current generation of electric MHDVs, besides infrastructure, is service, support and maintenance. Some of the smaller or early market manufacturers providing today's vehicles do not have the capacity for locating sufficient service or parts support centers to keep up with the early market. CEC funding for manufacturing sites, if extended to also allow for service, parts or maintenance centers, would be an extremely useful example of "creative meddling." These centers could potentially be shared sites, available to multiple vendors. The other beneficial outcome of these centers is they could become focal points for workforce training, and help train the needed expansion of technicians in key California regions.

We would welcome answering any questions on these comments. Feel free to reach out to me at the contact point below.

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