Build Your Dreams

BYD MOTORS LLC
1800 S Figueroa St
Los Angeles, CA 90015

January 30, 2019

Heather Tomley
Acting Managing Director of
Planning and Environmental Affairs
Port of Long Beach
4801 Airport Plaza Dr.
Long Beach, CA 90815

Chris Cannon
Director of Environmental Management
Port of Los Angeles
425 South Palos Verdes St.
San Pedro, CA 90731

RE: Comments – 2018 Draft Feasibility Assessment for Drayage Trucks

Dear Ms. Tomley and Mr. Cannon,

Please allow this letter to serve as formal comments submitted on behalf of BYD Motors LLC ("BYD") with respect to the recently released "2018 Draft Feasibility Assessment for Drayage Trucks" by both the Ports of Los Angeles and Long Beach ("Ports").

General Comments

In general, BYD is pleased that comprehensive surveys were done of both OEMs and a wide cross-section of the local drayage fleet operators. These findings show strong support among industry stakeholders for the successful implementation of the CAAP goals broadly and those specifically relating to the zero emission goals set forth by both Ports. BYD has long advocated for the rapid deployment of zero emission ("ZE") technologies for both terminal equipment and drayage trucks. The findings of the industry survey are consistent with those advocacy efforts. That being said, BYD encourages the Ports to set timelines to meet the 2035 ZE deadline which will ensure that emissions will be reduced in a timely manner and that goals are met in a reasonable fashion. These timelines should either require a certain percentage of new trucks be ZE by 2020, 2025, and 2030, or lay out a percentage of trucks that must be ZE along a similar timeline.

In terms of the technical feasibility findings, we appreciate the recognition of BYD's Class 8 offering and our focus in "accelerating efforts to commercialize and develop" our ZE platform. While we concur with the assessment that the all-electric ZE platform will achieve TRL 8 status by or before 2021, BYD is confident that our Class 8 program will easily exceed that time frame with several of our drayage trucks already deployed in California and several more being delivered in 2019. In addition, BYD has manufacturing capacity to meet a significantly larger demand. BYD has already purchased more than 150 acres of additional land in California and can expand our production capacity rapidly to meet any substantial increase in demand. BYD encourages the Ports to quickly develop and launch pilot projects at much larger scales than the 10-truck pilot projects discussed in the report. BYD would like to see pilot projects that are at least 50 trucks in scale to adequately assess the equipment's Technology Readiness Level.

In terms of the report's "operational feasibility" findings, we wanted to acknowledge and support your push for enhanced charging infrastructure. As corroborated by the survey results, the need for more commercially available and scalable charging stations is a key concern of customers that operate in and

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around the Ports. We applaud the Ports' efforts in seeking CARB and AQMD funding and SCE and LADWP participation to bring about additional Port-related charging equipment that will support ZE trucks in the future.

Although the report provides some side-by-side economic analysis of ZE and near-zero emission ("NZE") trucks fueled by natural gas with respect to environmental factors, we believe a more localized comparison would also be helpful, specifically with respect to the environmental health impacts of particulate matter and organic compounds. While recognizing that this assessment was focused on technical and operational issues (as well as economic) we are concerned that the public will believe that both platforms are environmental equals, while previous CAAP findings and even the goals set forth in the latest version of the CAAP recognize that they are not.

As such, we respectfully encourage the Ports to include additional language in the final version of the assessment which analyzes the difference in local impacts of all emissions between the different engine and fuel platforms. While the operational and technical feasibility of different platforms is primary to the assessment's goals, it would be inconsistent with the goals of the current CAAP to not address the environmental benefits and burdens of each engine type to the local San Pedro Bay community.

Lastly, we respectfully ask you to consider including policies that can be adopted to accelerate the technical, operational or commercial viability of ZE drayage trucks. Among the policies that were discussed concurrent with the adoption of the CAAP were financial incentives for the accelerated production and purchase of Class 8 trucks, the creation of fee exemptions for drayage operators that exceed the Ports' CAAP/CTP goals and also the potential creation of ZE or NZE dedicated lanes at terminal facilities. Although we understand these policy decisions are ultimately within the discretion of the respective Boards of Harbor Commissioners, we encourage staff to highlight the need and viability of potential incentives that could help meet or exceed the goals set forth in the CAAP. We understand that there is currently an effort underway and industry study looking at pricing for potential fees but this report may be a good vehicle to discuss potential exemptions and dedicated infrastructure – for example, green lanes – for early adopters.

In addition to the foregoing, some specific comments regarding data and conclusions presented in the report are as follows:

Specific Comments

Report Pages 4-5:

- Page 4 states, "ZE battery-electric trucks outperform diesel trucks in terms of power, torque, and gradeability," and then goes on to say that NZE NG trucks basic performance metrics are "generally comparable to diesel trucks."
- Despite this "outperform" language, the table on Page 5 only gives ZE Battery Electric truck the same ¾ circle as NZE NG ICE for Basic Performance, defined as "Demonstrated capability to meet drayage company needs for basic performance parameters including power, torque, gradeability, operation of accessories, etc." Accordingly, a full circle appears to be the more appropriate characterization in this instance for ZE Battery Electric trucks.

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Report Page 7:

- The chart on Page 7 only assigns ¼ circle for Infrastructure Capital and Operational Costs ZE Battery Electric-truck despite the current availability of SB 350 money that supports infrastructure development over the next five years. Considering this factor alone, at least a ½ circle appears more appropriate for this criterion.
- Also, more information should be provided to better understand the reasoning behind a full circle designation for this criterion for NZE NG ICE since natural gas infrastructure is typically expected to require significant capital costs. Renewable Natural Gas could be even more problematic from a cost/availability perspective.

Report Page 12:

- Page 12 notes that there are three basic types of drayage service with different energy and power needs and although trucking companies currently do not have special fleets to focus on a specific type of drayage service, they could in the future.
- Although this report is understandably a snapshot of the present and not the future, more detail regarding how fleets can design their operations today to quickly deploy zero-emissions technology for feasible duty cycles should be provided.

Report Page 44:

- Table 12 is a chart from a North American Council on Freight Efficiency (NACFE) study comparing battery electric and diesel trucks for a variety of factors.
- Since this study is behind a paywall, it would be helpful if more context was provided to better understand these comparisons. This is particularly true for criteria like 'Safety' and 'Operating Cost' which should already be at parity for battery electric and diesel trucks but are not listed as such in this chart. More information is needed to understand these conclusions.

Report Page 78:

- Page 78 discusses permitting concerns and states that "early infrastructure projects will undoubtedly require more time to permit than latter projects."
- It would be helpful if this section also considered the impact of the projected significant involvement of utilities in not only the broader transportation planning effort but also at the near-term local project level and whether this involvement could help speed permitting.

Report Page 79:

- Section 8.5 only includes additional references regarding battery electric deployment.
- If possible, this section should also include further information about NZE NG deployment.

Report Page 81:

- The criteria achievement for the criteria in Table 27 analyzing infrastructure availability underestimates availability of charging infrastructure for battery electric trucks.
- For example, Station Location and Footprint and Infrastructure Buildout are two criteria that should be considered higher than ¼ circle when one takes into account the currently available variety of charger types, sizes and deployment opportunities – including inductive and overhead charging. These options, combined with intentional facility design and planning can go a long way towards meeting fleet needs and the pace of deployment underpinning these criteria. Moreover,

the SCE Charge Ready program must also be considered when assessing infrastructure availability and buildout.

Report Page 86:

- Although Section 9.3 Table 32 states the mpDGE of the fuels being compared, Section 9.3.1 Fuel Economy does not provide on a per-mile fuel economy calculation/comparison of the different fuel types. This calculation could be helpful as a comparative analysis might not otherwise be intuitive for the reader.

Report Page 89:

- Page 89 notes that the California VLF can add substantial costs over the 12-year life of the vehicle and we agree.
- The document should note that eliminating VLF for zero emission trucks in the short term could be a factor in increased adoption of the technology.

Report Page 95:

- Table 37 on Page 95 includes the Carbon Intensity (CI) for diesel, NZ NGV and BEV taken from the CARB LCFS Final Regulation Order. However, this table and section does not include any discussion of the related Energy Economy Ratio (EER).
- According to the CARB LCFS Final Regulation Order Table 7.1, the EER must be applied to the CI for each fuel as the EER-adjusted CI is the value to be used when comparing fuel types. Doing so in this instance for electricity should provide a much lower EER-adjusted CI than the one used in the report.
- It would also be helpful to see the calculations relied on for the conclusions made in Section 9.8.

BYD-Specific Comments

Report Page 25:

- Although BYD has deployed fewer than hundreds or thousands of drayage trucks in the US, as noted on this page of the report, NZE NG gas drayage deployments only total 22, also fewer than hundreds or thousands. By the end of Q3 2019, BYD will have deployed over 25 drayage trucks.
- Also just as noted in the report for NZE NG, despite this, BYD currently has the manufacturing capacity to deploy, at the very least, hundreds of vehicles over the next three years given proper lead times.

Report Page 84:

- The price quoted for the BYD 8TT of $300,000 was for a previous model year and does not apply to the 2019 model, pricing for which has not yet solidified.

Report Page 89:

- BYD does not provide a 12-year warranty for truck batteries.

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Report Page 91:

- Although this page uses $105,000 as the reference price for 60kW DC charger, BYD provides both AC and DC chargers that are significantly less expensive than this price point.

We appreciate your consideration of these comments. Please advise if you have any questions or would like to discuss any of these matters further.

Sincerely,

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January 30, 2019

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Submitted via email to caap@cleanairactionplan.org

Re: Comments on Draft Assessment of Clean Truck Technology Released by the Ports of Los Angeles and Long Beach

The California Electric Transportation Coalition (CalETC) appreciates the opportunity to provide feedback on the Draft 2018 Feasibility Assessment for Drayage Trucks (Draft Assessment), released by the Ports of Los Angeles and Long Beach, which is intended to help the Ports reach the targets of the San Pedro Bay Ports' Clean Air Action Plan.

CalETC supports and advocates for the transition to a zero-emission transportation future as a means to spur economic growth, fuel diversity and energy independence, ensure clean air, and combat climate change. CalETC is a non-profit association committed to the successful introduction and large-scale deployment of all forms of electric transportation. Our board of directors includes: Los Angeles Department of Water and Power, Pacific Gas and Electric, Sacramento Municipal Utility District, San Diego Gas and Electric, Southern California Edison, and the Southern California Public Power Authority. Our membership also includes major automakers, manufacturers of zero-emission trucks and buses, electric vehicle charging providers, and other industry leaders supporting transportation electrification.

California's 2016 Sustainable Freight Action Plan emphasizes the need to transition to zero-emission technologies and sets a vision for "[t]ransporting freight reliably and efficiently by zero emission equipment everywhere feasible, and near-zero emission equipment powered by clean, low-carbon renewable fuels everywhere else."[1] Additionally, in 2017, the Mayors of Los Angeles and Long Beach set goals for the Ports to transition to zero-emission terminal equipment by 2030 and a zero-emission drayage fleet by 2035.[2] The 2017 San Pedro Bay Ports' Clean Air Action Plan (CAAP) Update aligns with the California Sustainable Freight Action Plan and these targets set by the Mayors, as many of the

[1] California Sustainable Freight Action Plan, State of California, Governor Edmund G. Brown, Jr., July 2016, p. 8.
[2] San Pedro Bay Ports Approve Bold New Clean Air Strategies, Ports of Los Angeles and Long Beach, News, November 2017, http://www.cleanairactionplan.org/2017/11/02/san-pedro-bay-ports-approve-bold-new-clean-air-strategies/. See also 2017 Clean Air Action Plan Update, San Pedro Bay Ports, November 2017, p. 24.

updates to the CAAP "are designed to significantly advance the push toward zero emissions..."[3] This push to zero-emissions technologies is necessary to meet our climate change and air quality goals, but is especially critical to reduce negative health impacts to the most vulnerable communities near the Ports. The CAAP Update notes that although much progress has been made, "residents nearest the Ports still face higher pollution-related health risks than the rest of the Southern California population, and most of the neighboring areas are classified as 'disadvantaged' communities...."[4]

We commend the Ports on their commitment to transition to zero-emission technologies and their commitment to dedicate investments and other resources toward achieving this target to date.[5] However, we are concerned that the Draft Assessment is not aligned with these important targets and inaccurately characterizes the ability of zero-emission trucks to be used effectively by the Ports in the near-term.

CalETC respectfully provides the following feedback on the Draft Assessment:

I. The Draft Assessment should be revised to evaluate how the Ports' drayage-truck fleets can begin the transition to zero-emission technologies in the near-term.

The Draft Assessment analyzes the feasibility of alternative fuel drayage trucks to provide similar or better overall performance compared to today's baseline diesel drayage trucks and evaluates commercial availability, technical viability, operational feasibility, availability of infrastructure and fuel, and economic workability.[6] The Draft Assessment identifies that "ZE battery electric trucks outperform diesel trucks…but are currently only applicable to a subset of drayage operations due to limitations on vehicle range, weight, and recharging times."[7] Furthermore, battery-electric truck platforms are identified as capable of meeting minimum performance specifications and the range of battery-electric trucks is "sufficient to meet the average shift and daily range of drayage trucks."[8] And while the Draft Assessment recognizes that battery-electric trucks could replace a meaningful fraction of drayage operations, the Assessment appears to conclude that zero-emission drayage trucks are not a viable option in the near-term.[9]

CalETC understands the Draft Assessment findings are a "snapshot in time," but we recommend the Ports update the Draft Assessment to estimate how many existing drayage trucks could be replaced by

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[3] Clean Air Action Plan Update, San Pedro Bay Ports, November 2017, p. 25.
[4] Clean Air Action Plan Update, p. 20.
[5] Clean Air Action Plan Update, pp. 24, 29-31.
[6] Draft 2018 Feasibility Assessment for Drayage Trucks, Tetra Tech & Gladstein, Neandross & Associates, December 2018, p. 1.
[7] Draft 2018 Feasibility Assessment for Drayage Trucks, pp. 4-5.
[8] Draft 2018 Feasibility Assessment for Drayage Trucks, pp. 59-61.
[9] Draft 2018 Feasibility Assessment for Drayage Trucks, pp. 61, 107-110.

zero-emission trucks in the near-term. The Ports should also establish interim zero-emission truck and fueling infrastructure milestones from now to 2035, to ensure that the 2035 zero-emissions target and related climate change, air quality, and public health objectives will be met.

The Draft Assessment does not appropriately analyze or weigh the emissions reductions or public health benefits of the technologies evaluated. One of the primary drivers of the targets in the California Sustainable Freight Action Plan and the CAAP Update is emissions, and the Sustainable Freight Action Plan specifically states that zero-emission equipment should be used everywhere feasible, and near-zero-emission equipment powered by clean, low-carbon renewable fuels should be used everywhere else.[10] We disagree with some of the ways feasibility is evaluated in the Draft Assessment, which is addressed in section III, below.

Regarding public health, community representatives most impacted by the Ports' operations believe zero-emissions technologies are the only acceptable way forward and have been advocating for this solution for years.[11] In addition to the emissions reductions of the evaluated technologies, public health considerations must be given appropriate weight when evaluating which technologies to pursue.

CalETC recognizes and appreciates the investments made by the Ports in zero-emission technologies to date, but we are concerned that this Draft Assessment will impact the Ports' near- and mid-term purchasing, incentive, and other decisions. Significant progress could be made to transition a substantial portion of the truck fleet to zero-emission trucks and update the Ports' infrastructure to support even greater zero-emission transformation beyond 2021. Delaying the transition to zero-emission trucks and delaying the installation of the infrastructure to support these trucks, as well as other Port equipment, is contrary to the clear targets of the California Sustainable Freight Action Plan, the Mayors' zero-emission drayage truck fleet 2035 target, and California's climate change, air quality, and public health objectives, particularly in disadvantaged communities.

II. CalETC recommends the Ports review our recently-released literature review, Medium- and Heavy-Duty Electrification in California, to inform revisions to the Draft Assessment.

CalETC and a number of other organizations recently released a literature review titled Medium- and Heavy-Duty Electrification in California, which analyzes the current status of medium- and heavy-duty electrification technologies, current and forecasted trends in vehicle and battery costs, and the emissions

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[10] California Sustainable Freight Action Plan, State of California, Governor Edmund G. Brown, Jr., July 2016, p. 8.

[11] See, e.g., Right to Zero Campaign, https://earthjustice.org/features/right-to-zero; Environmental Justice Leaders Call for Zero-Emission Strategies at Ports, http://blogs.edf.org/texascleanairmatters/2015/06/02/environmental-justice-leaders-call-for-zero-emission-strategies-at-ports/; A Call for Environmental Justice: A Call for "Zero," https://www.nrdc.org/experts/melissa-lin-perrella/call-environmental-justice-call-zero.

benefits from these technologies. [12] We believe that this report could be used to update the data and assumptions used in the Draft Assessment. The key findings from our literature review include:

- Medium- and heavy-duty battery-electric vehicle technologies are advancing quickly.
- The overall cost of medium- and heavy-duty battery-electric vehicles are decreasing due to operational efficiencies from increased vehicle production and steady declines in battery costs.
- Batteries are the biggest contributor to BEV cost (upwards of 40-60%) and the literature agrees that battery costs are decreasing rapidly–faster than anticipated even a few years ago–and will continue to come down in future years.
- Overall, medium- and heavy-duty battery-electric vehicles have lower operation, maintenance, and fuel costs compared to conventional-fueled vehicles.
- Medium- and heavy-duty battery-electric vehicles provide the largest per vehicle opportunity for greenhouse gas and criteria pollutant emission reductions compared to conventional vehicles.

The literature review analyzes the technology status and costs of vehicles, batteries, and charging infrastructure, and compares the emissions of battery electric, natural gas, and diesel vehicles. We urge the Ports to review the data and findings present in the literature review to update the Draft Assessment's assumptions.

This literature review is step one of a four-part assessment intended to better illustrate the costs and benefits of different advanced technologies that can be used to meet California's air quality and climate targets. We look forward to continuing to work with the Ports and sharing our findings as this project progresses, and we note that the market for zero-emission trucks is advancing rapidly. Making decisions now to invest in and support zero-emission trucks and fueling infrastructure will set the Ports on a path to achieve the broader zero-emission transition that is needed to meet the 2035 zero-emission trucks target, as well as the Ports' underlying greenhouse gas, air quality, and public health objectives, particularly in disadvantaged communities surrounding the Ports.

III. The overall achievement ratings for battery-electric trucks should be updated, and the feasibility categories should be revisited.

The Draft Assessment evaluates five feasibility parameters, including commercial availability, technical viability, operational feasibility, availability of infrastructure and fuel, and economic workability.[13] In the Draft Assessment, "the overall achievement ratings [for battery-electric and natural-gas trucks] are based

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[12] Available at: http://www.caletc.com/wp-content/uploads/2019/01/Literature-Review_Final_December_2018.pdf. This report was prepared by ICF for CalETC, in partnership with BYD, Ceres, Earthjustice, Natural Resources Defense Council, NextGen Climate America, Union of Concerned Scientists, and Tesla, with advisory support from East Yard Communities for Environmental Justice.

[13] Draft 2018 Feasibility Assessment for Drayage Trucks, pp. 1, 107.

on the lowest criterion score for each feasibility parameter."[14] By averaging only the lowest scores from each of the feasibility categories, the Draft Assessment mischaracterizes the overall feasibility of transitioning to battery-electric drayage trucks. The Draft Assessment should be updated to use an average of the scores from each feasibility category in the final overall achievement ratings.

Furthermore, the five feasibility categories selected and the underlying assumptions for the feasibility categories should be revisited, and viewed in the appropriate context, before decisions are made on near-term and post-2021 investments. The following list provides examples where we think improvements can be made in the Draft Assessment, or where we think the conclusions drawn are not viewed in the proper context.

- The cost-effectiveness of reaching the CAAP's targets must be assessed in the context of the state's air quality climate change objectives, with an eye toward improving the local air quality at and around the Ports. Multiple assessments fin that electrification is the most cost-effective alternative technology that can be used to achieve an overall set of emissions reductions.[15]
- The Draft Assessment compares battery-electric trucks and natural-gas trucks to the performance, and generally the experience, of diesel drayage trucks.[16] However, the Draft Assessment ranks battery-electric trucks as less desirable if the experience is different, for example, with fueling or operations.[17] Feasibility should not be a measure of whether a technology is the same as what a fleet is used to. And, we note that a full-circle rating for battery-electric trucks seems more appropriate for the category of "basic performance," given the Draft Assessment's prior characterization that battery-electric trucks "outperform diesel trucks…" while natural gas trucks are "generally comparable to diesel trucks."[18]
- We agree that truck demonstrations serve an essential role in commercialization[19] and think it's important for the Ports to look at this Draft Assessment in the context of additional opportunities to electrify, other than the purchase of only commercial technologies, as defined in the Draft Assessment. We support the Ports' demonstrations to date and urge the Ports to continue demonstrating, increasing their zero-emission fleet, and making meaningful investments to support continued and expanded zero-emissions operations.
- The Draft Assessment notes that "where battery-electric drayage trucks can meet operational requirements, current incentives make these trucks dramatically less expensive to operate than

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[14] Draft 2018 Feasibility Assessment for Drayage Trucks, p. 107.
[15] See, e.g., The International Council on Clean Transportation (ICCT), Transitioning to Zero-Emission Heavy-Duty Freight Vehicles, https://www.theicct.org/sites/default/files/publications/Zero-emission-freight-trucks_ICCT-white-paper_26092017_vF.pdf, pp. 23-24 ["…electrification is the most cost-effective technology for freight transport in the long-term"].
[16] Draft 2018 Feasibility Assessment for Drayage Trucks, generally.
[17] Draft 2018 Feasibility Assessment for Drayage Trucks, see, e.g., pp. 51-70, 71-82.
[18] Draft 2018 Feasibility Assessment for Drayage Trucks, see, e.g., pp. 4-5, 69.
[19] Draft 2018 Feasibility Assessment for Drayage Trucks, p. 27.

diesel trucks."[20] But, the conclusion drawn in this section, on economic workability, is that battery-electric trucks are not affordable to end users. The signal that should instead be sent by this section is that fleets can transition in the near-term to battery-electric trucks and take advantage of available funding, both for vehicles and infrastructure improvements, resulting in more affordable operations than existing diesel trucks.

- Regarding the determinations made on infrastructure capital and operational costs, it appears that battery-electric trucks are undervalued.[21] This portion of the Draft Assessment should be updated to account for investments stemming from the Clean Energy and Pollution Reduction Act of 2015 (SB 350, De León). The Draft Assessment should update the costs based on infrastructure assistance available from Southern California Edison and Los Angeles Department of Water and Power.
- More information should be included to explain why natural gas infrastructure received a full-circle rating for infrastructure capital and operational costs, given that this infrastructure requires significant upfront capital costs. Renewable fuel for natural gas trucks should be further addressed in the Draft Assessment, e.g., availability, costs, challenges, as we assume that this fuel source would be relied upon to meet the targets of the Sustainable Freight Action Plan and CAAP. Additionally, delaying or displacing investments that could be made in infrastructure to support zero-emission trucks will hinder the Ports in meeting their long-term zero-emission targets.
- Page 95, Table 37 should be updated to apply the relevant Energy Economy Ratio (EER) to the carbon intensity to account for the efficiency of the alternative fuel as compared to a reference fuel used in the same powertrain.[22] These values have a significant impact in evaluating the relative carbon intensity of alternative fuel options. When correcting for this, and if using Southern California Edison's carbon intensity of 66.65 gCO2e/MJ, medium- and heavy-duty electric vehicles are 66% - 85% less GHG-intensive than natural-gas fueled vehicles, a dramatic difference from what the report concludes.[23]
- Relative to costs, we do not believe emissions reductions and public health benefits for the communities near the Ports are appropriately considered for the technologies evaluated. Specifically, the Draft Assessment should include localized health impacts of particulate matter and organic compounds for the technologies evaluated. It would be inconsistent with the goals

[20] Draft 2018 Feasibility Assessment for Drayage Trucks, p. 100.
[21] Draft 2018 Feasibility Assessment for Drayage Trucks, pp. 7, 90, 99.
[22] Draft 2018 Feasibility Assessment for Drayage Trucks, p. 95.
[23] CI Intensity cited in Table 37 the report for conventional is 79.21 gCO2e/MJ for CNG and 39.60 gCO2e/MJ for RNG. Compared with the values cited for charging BEVs in Table 37 (93.75, 91.27 gCO2e/MJ). This initially purports a 16% to 57% carbon intensity *improvement* of using natural gas fuels over electricity from the grid. When necessary EER ratios are taken into account per the methodology described by CARB, the resulting CI for natural gas is 79.21/0.9 = 88.01 gCO2e/MJ to account for the efficiency penalty of spark-ignition natural gas engines. The value for RNG is cited as coming from the LCFS Dashboard instead of Table 7 which displays values that have already been EER-adjusted so that value can remain at 39.60 gCO2e/MJ. Charging with electricity from SCE's grid and accounting for the EER adjustment of 5 yields a CI for BEVs of 13.33 gCO2e/MJ, an 85% improvement over conventional compressed natural gas when compared to the EER-adjusted value of 88.01 gCO2e/MJ and a 66% improvement when compared to RNG at 39.60 gCO2e/MJ.

of the current CAAP to not address the environmental benefits of each engine type to the local San Pedro Bay community. These communities have made their voices heard and it is clear they want the benefits of zero-emission technologies in the near term.

CalETC appreciates the opportunity to provide feedback on this important step in implementing the CAAP and thanks staff for the extension to file comments. We look forward to further opportunities to provide input on the Draft Assessment and the CAAP process. Please do not hesitate to contact me or Hannah Goldsmith at (916) 551-1943, eileen@caletc.com, or hannah@caletc.com should you have any questions.

Sincerely,

Eileen Wenger Tutt, Executive Director
California Electric Transportation Coalition

cc:
Chris Cannon, Port of Los Angeles
Heather Tomley, Port of Long Beach

California Natural Gas Vehicle Coalition

January 22, 2019

Heather Tomley, Port of Long Beach
Chris Cannon, Port of Los Angeles
Submitted to: caap@cleanairactionplan.org

Re. Comments on Draft Feasibility Assessment of Clean Truck Technology

Dear Heather and Chris:

We have reviewed the Draft Feasibility Assessment of Clean Truck Technology and appreciate the opportunity to submit the following comments. Our comments are organized under the topics of the near-zero engine, natural gas fueling infrastructure, and report technical corrections.

Near-Zero Engine Comments

We support the comments submitted separately by Cummins Westport (attachment). Trucks equipped with the ISX12N are fully commercially available, viable, and cost-effective while reducing air and climate pollutants on par with, and even better than, other competing low emissions technologies.

We believe that the near-zero natural gas trucks technology is incorrectly classified as Technology Readiness Level (TRL) 8 in the report. The ISX12N engine is fully commercialized and integrated into major Original Engine Manufacturer chassis and are built on the same production lines as its diesel counterparts.

The document makes several unsubstantiated statements about near-zero engine technologies such as "they are still undergoing proof of feasibility testing" and "has not yet transitioned into full commercial status for Class 8 trucking in the San Pedro Bay Ports drayage service." There are over 20 near-zero trucks operating at the port, some of which have been running for almost two years and have collectively accumulated over 400,000 miles. Additionally, the ports, with South Coast Air Quality Management District and the California Energy Commission are providing grants for 140 near-zero natural gas trucks. These grants are for commercial use – not for demonstrations or feasibility studies. Outside of the port area, over 2,100 ISX12N engines have been deployed.

This is substantial, real world experience within and outside of the ports. It is clear that the near-zero natural gas technologies are beyond feasibility testing and are fully commercial. Therefore, the document should be revised to classify the near-zero natural gas technology TRL 9.

Commercially produced ISX12N trucks have already been delivered to port trucking companies and more will continue to be delivered this year. The ISX12N has achieved a technology readiness level of TR9 and the report should be revised accordingly.

Natural Gas Fueling Infrastructure Comments

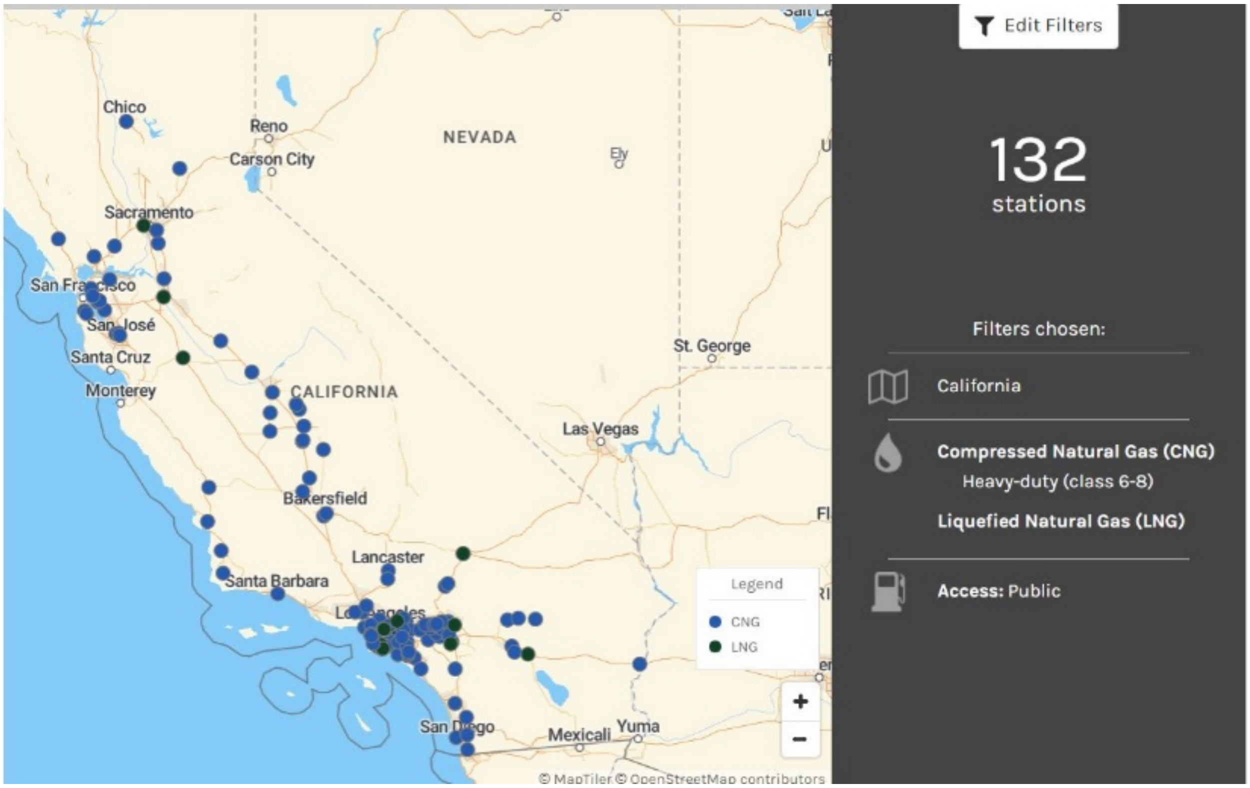
The natural gas fueling industry disagrees with the skepticism and hesitancy expressed in the opinions of the report authors towards natural gas fueling. We feel that the views as expressed in the following examples are unfounded:

Page	Statement
6	"….by 2021 remains in doubt."
71	"Given the relative paucity…."
74	"A credible plan… has not been put forward…to deliver on these needs uncertain."
82	"….by 2021 is unclear."
108	"The ability to deploy this infrastructure quickly remains in doubt."

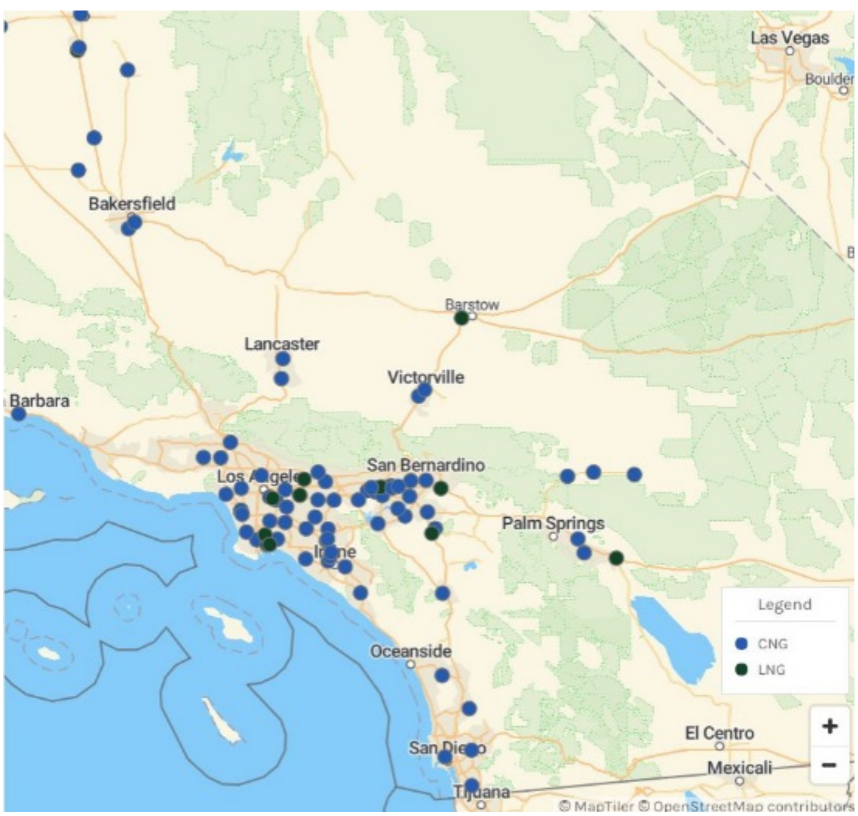
First, to be clear, the authors of the study did not contact the natural gas fueling industry while preparing the report. Second, the authors of the study did not quantify the currently existing infrastructure to determine the starting point for fueling natural gas port trucks. The Ports are relying on this document to inform important policy decisions under the CAAP. The Ports deserve to make these policy decisions based on actual data and facts.

As a side note, the real hesitancy in industry, whether a trucking company or a fueling company, is over the lack of visibility on the timing and amount of the container rate called for in the CAAP. Once the container rate timing and amount are known, companies can make decisions on investing capital in near-zero trucks and fueling stations.

According to the federal Alternative Fuels Data Center (afdc.energy.gov), there are currently 132 publicly accessible heavy-duty truck CNG and LNG fueling stations in California. These are public stations. The count does not include private truck stations that have been deployed. Being truck stations, these stations are built in areas that service trucks. The map images below show that the stations are clustered in areas and along goods movement corridors that are traveled by trucks. The map image also shows that a good number of CNG and LNG truck stations are in Southern California areas that are traveled by port drayage trucks.



Statewide Public CNG & LNG Truck Stations



Port Drayage Area Stations

The map images above show that the NG stations have a higher concentration in the greater LA area compared to the rest of the state. Over 50 of the 132 stations are located in the four counties of Los Angeles, Orange, Riverside and San Bernardino. Natural gas fueling stations are flexible in size, design and configuration reflecting the variable needs of trucking companies. Stations range from multi-lane truck stops to single lanes. Flexibility and scalability are the strengths of natural gas fueling in meeting the many unique demands of truckers.

Multi-Lane Station

Two-Lane Station

The fact is that the station infrastructure is overbuilt for the current natural gas truck market in California. This is a bad news, good news situation. The bad news is that station infrastructure is underutilized to the detriment of the station owners. The good news is that there is tremendous capacity available to service new near-zero port trucks. NG truck stations often have two dispensers and sometimes 1 dispenser (except the Clean Energy port station with 6 truck dispensers). The Clean Energy station has been proven to support up to 1,000 trucks, giving a rule-of-thumb of 165 trucks per dispenser. Assuming to be conservative that the 50 stations in the 4 county area have only 1 dispenser and are 70% utilized, the existing station network has a capacity of 50 stations x 1.0 dispenser each x 165 trucks/dispenser x 30% availability = 2,475 trucks plus 1,000 trucks for the Clean Energy port station = almost 3,500 trucks. This is not "paucity". This is a fantastic starting point and illustrates the significant station investments made by various parties over the past 10 years.

This is just the starting point. The report authors are completely incorrect implying that the industry has no plan simply because the authors are not aware of the plans, nor was the natural gas fueling industry contacted about a potential plan. The natural gas fueling industry is driven by private investment by many companies as opposed to the electric charging industry that is driven by utilities spending ratepayer money in publicized programs. The natural gas fueling industry will expand the number of fueling stations with demand as they have always done. This demand starts with clear policy set by the Ports under the CAAP. Both public and private infrastructure investments will grow. For example, Clean Energy this year will expand the availability of CNG at the port station by providing CNG dispensers at all 6 lanes. The station was built with the plan to expand the station to 10 lanes as the market grows. That being said, each fueling company has their own market expansion plan. Since this is a competitive market, the individual companies do not broadcast their plans. The plans do exist, execution simply requires policy certainty.

The authors cast doubt about the industry's ability to rise to the occasion and meet demand. Clean Energy alone constructed 70 truck stations in a single year to build America's Natural Gas Highway, allowing trucks to travel coast-to-coast and border-to-border on natural gas. Each station has 2 dispensers for a total of 140 dispensers. Using the 165 truck rule-of-thumb, these stations have the capacity to serve

23,000 trucks. These stations were built throughout the US, many with challenging permitting, many in inclement weather, and many with site-specific development issues. Even if all 18,000 currently registered drayage trucks are replaced by near-zero trucks, less than 100 additional fueling dispensers are needed to fuel the entire fleet. This is less than 50 stations with 2 dispensers each. The report states that there are 2,500 diesel stations within the bounds of drayage trucks. Merely 2% of the existing diesel stations adding CNG dispensing would meet the incremental fueling requirements of port trucks. This doesn't even take into consideration that fueling will be a mixture of public and private stations.

The natural gas fueling industry certainly has the financial capacity and the construction capability to meet this demand. Private sector funding is available for additional station build-out, eliminating a great unknown for ZE technologies. Ratepayers and taxpayers are not on the hook for natural gas fueling as they are with ZE truck charging/fueling infrastructure.

Forecasted TRLs

Port staff has described the feasibility document as a snapshot in time and is not intended to determine when technologies would become available. However, the document includes forecasted TRLs within a three-year timeframe. We are concerned with the forecasts because the authors did not conduct adequate research and analysis to make such determinations. While the intent of the authors may be to give an "educated prognosis," or their best guess, this information would likely be misconstrued by the public and policy makers to be a thorough technical analysis and a definitive TRL forecast. We recommend that the forecast be removed from the document or very clear disclaimers be included that indicate that the forecasts are not technical analyses and therefore should not be cited.

Report Technical Corrections

Page	Comment
10	The sidebar definition of zero emission (ZE) should simply refer to zero tailpipe emissions. Zero tailpipe emissions is the commonly understood meaning of ZE. Defining ZE as "does not directly emit any regulated pollutants" is misleading and inaccurate. A grid-powered ZE uses power produced by coal plants and natural gas plants in addition to renewables. Air pollution released in generating electricity is directly caused by charging the ZE truck. Climate pollution is independent of the release location and air pollutants released into another community remote from the truck location is still air pollution.
10	The sidebar definition of near-zero is unnecessarily vague. CARB has established three levels of optional low-NOx standards. Commercial technology has already achieved certified compliance with the lowest optional standard of 0.02 g/bhp-hr. Therefore, it is unnecessary to be vague. The report should specifically use the optional low NOx standard of 0.02 as the working definition of near-zero.
25	The report expresses uncertainty with the truck manufacturing industry's capacity to mass produce natural gas trucks. Natural gas trucks are produced by Freightliner, Kenworth, Peterbilt, Volvo and Mack. Heavy duty truck manufacturers routinely produce over 200,000 Class 8 trucks per year. Less than 10% of annual production is needed to completely replace every drayage truck in one year, let alone stretching this over 3 or more years. Cummins has the factory capacity to build these engines in a single year. The five major fuel system

	companies have the capacity to meet the demand in one year or over three years. The industry can produce the number of NZE trucks needed by the ports over the next one to three years and beyond.
28	This comment applies to the text and the graph. As noted above, a total of 21 NZE pre-production trucks have been deployed in the ports starting with the first unit deployed in Q1 2017. Additionally, Cummins Westport performed national testing of pre-production near-zero engines with the leading trucking companies throughout the US. These efforts conclude the demonstration testing of the engine. The engine is no longer in demonstration. The technology is fully proven and commercialized for the market.
29	As noted above, a total of 21 NZE pre-production trucks have been deployed in port drayage. 5 of the trucks are LNG and 16 are CNG. The 21 trucks have accumulated over 400,000 miles since being placed in service.
62	The text states that LNG trucks were typically fueled every day. This may be the case for the trucks manufactured 10 years ago, but is irrelevant to today's CNG and LNG trucks. Today, natural gas fuel systems are modular to match the duty cycle and requirements of the operator. Trucks can be equipped for over 1,000 miles of range if needed. Today's natural gas truck buyer will select the fuel system size that is optimized for their specific application. We expect fueling frequencies to be typically 2 to 3 days depending on the fuel system configuration specified by the truck buyer.
66	The comparison of weights neglects to include the 2,000 pound weight allowance provided by federal and California law for alternative fuel technologies. The report needs to include the 2,000 pound weight allowance to give readers a truck and accurate comparison of payload capacities between the technologies. Omitting the 2,000 pound allowance can mislead the reader into drawing erroneous conclusions on weight impacts.
68	The report correctly states that natural gas trucks can be maintained by the truck dealerships and at Cummins shops. The report should also state that leasing companies and third party maintenance providers also service natural gas trucks.
71	The report provides stats on the number of diesel stations in California and the drayage areas. The report needs to be clear whether these stats are specifically only truck-accessible diesel stations. If the stats include light duty diesel stations, then the report is completely misleading in terms of comparing truck-accessible natural gas fueling with diesel fueling.
73	The report incorrectly states the configuration of the Clean Energy station. The Clean Energy station has 50,000 gallons of LNG storage (not 40,000). The station storage can be expanded to 100,000 gallons of LNG storage (not 60,000). The station can be expanded from the existing 6 lanes to 10 lanes. The text and related conclusions need to be revised.

The natural gas fueling industry is strongly positioned to support the transition to near-zero trucks under the CAAP. Existing infrastructure is already available to fuel on the order of 3,500 drayage trucks. The capital and construction capabilities are ready to expand this infrastructure to fuel 18,000 drayage trucks. The catalyst to begin the investment and associated jobs is for the Ports to provide visibility as soon as possible to the industry on the timing and amount of the container rate called for by the CAAP.

Thank you for considering our comments. We are committed to supporting the Ports of Long Beach and Los Angeles in developing a fact-based assessment of our industry's readiness and capabilities. We are ready to meet and discuss our comments and any further concerns.

Sincerely,

Thomas Lawson
California Natural Gas Vehicle Partnership

Greg Roche
Clean Energy

Kevin Maggay
Southern California Gas Company

Doug Epperhart
President
Dean Pentcheff
Vice President
Shannon Ross
Secretary
Louis Dominguez
Treasurer

COASTAL SAN PEDRO NEIGHBORHOOD COUNCIL

January 23, 2019

Port of Los Angeles
Chris Cannon, Director Environmental Management
P. O. Box 151
San Pedro CA 90733-0151
caap@cleanairactionplan.org

Subject: Draft 2018 Feasibility Assessment for Drayage Trucks Comments Submittal

At the January 22, 2019 meeting of the Board of Directors, the following resolution was passed:

Resolved, the Coastal San Pedro Neighborhood Council shall submit the following letter to the Port of Los Angeles as a comment to the "Draft 2018 Feasibility Assessment for Drayage Trucks"; and
Be it further resolved, the Coastal San Pedro Neighborhood Council requests a minimum of a 60 day extension to the comment period.

To whom it may concern,

The policy and investment likely to result from the Ports' Truck Feasibility Assessment will greatly influence policy decisions and investments throughout the US and even beyond by driving economies of scale, market dynamics, and advancing technological capability. I thank you greatly for requesting Comments and note that the current Draft Feasibility Assessment is based on static parameters which will drive planning limited to specific technologies and economics that may prove ill-advised as engineering advancements and changes in fuel and infrastructure costs and availability evolve.

The Study must provide evaluations of multiple scenarios for phased implementations of different fuel technologies, even simultaneously in varying mixes, and must not focus on limited implementation models, such as the current 11,000 Broadly Applicable Truck population.

The costs modeled in the Study must be considered variable due to evolving economic conditions and not limited to single scenario calculations such as the Total Cost of Ownership based on 12 years, fixed costs of fuels and batteries, hydrogen production, and electric utility rates.

The work of the Study must continue as an uninterrupted, on-going effort to update affected sections as technology advances and economic forecasts change. The Study must be considered a dynamic and living document with revisions to be issued with the quarterly Clean Air Action Plan updates, next planned for 1st Quarter 2019.

Please also consider the concern that, as trucks are the greatest contributor to Greenhouse Gas emissions at the Port of Los Angeles and a top contributor at Long Beach, the production, storage, and transfer of natural gas releases methane, a significant and long-lasting Greenhouse Gas. Any calculations of the benefit resulting from reduction in tail pipe emissions from Natural Gas fuel technologies must be revised to include consideration of the increased methane release, estimated at between two and three percent of natural gas consumed.

Please consider the following four examples as potential efforts to broaden the evaluation to multiple Assessment scenarios as suggested above which could be performed through pro- forma spreadsheet software:

1) Model varying quantities of truck fuel technology platforms among the fleet of frequent and infrequent truck populations. Among the complete fleet of trucks, evaluation of discreet quantities by technology type provides broader perspective with different numeric outcomes through varying the quantities in each fuel-technology platform. Cost projections must be modeled based on the multiple fuel technology mix scenarios.
2) Provide varying time period projections for Total Cost of Ownership allowing for different financing and capital expense strategies and planning.
3) Calculate cost outcomes based on multiple scenarios as the costs associated with each fuel technology and infrastructure is likely to vary and are subject to changes. For example, the electricity charge estimated for Department of Water and Power may be reduced substantially based on an Electric Vehicle rate, the cost of Natural Gas may rise substantially, and advancements in hydrogen production will drastically reduce the cost of fuel cell power.
4) Evaluation must be included of the potential impacts from a marginal container fee to fund California State Ports' leadership in the transition to cleaner technology, which may greatly affect Total Cost of Ownership through increased incentives and subsidies possible through a shipping fee implemented state-wide.

We request your consideration of and response to the above recommendations.

Thank you.

Douglas Epperhart

Doug Epperhart
President
On behalf of the Coastal San Pedro Neighborhood Council Board

January 23, 2019

RE: Clean Air Action Plan 2017,

Submitted via: caap@cleanairactionplan.org

The California Trucking Association (CTA) and Harbor Trucking Association (HTA) represent the preponderance of licensed motor carrier (LMC) interest in the San Pedro Bay port complex.

Thank you for the opportunity to comment on the Draft San Pedro Bay Ports Clean Air Action Plan 2018 Feasibility Assessment for Drayage Trucks ("the Assessment").

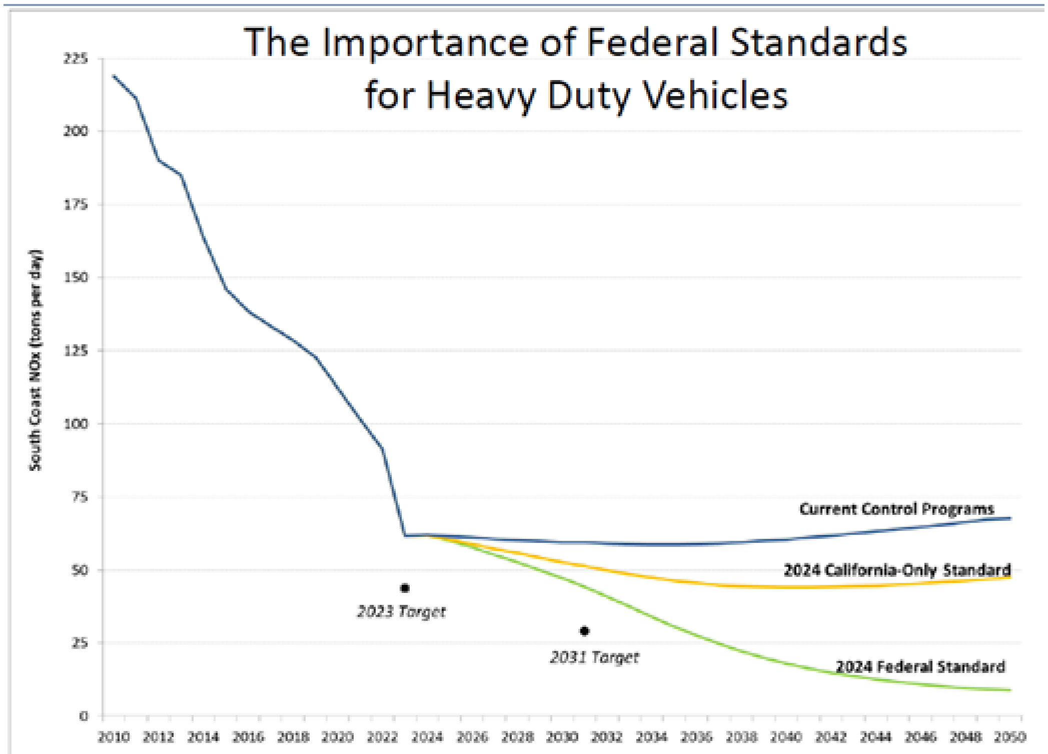
The Assessment Omits Key Regulatory Information

On November 14, 2018, the Environmental Protection Agency (EPA) announced the Clean Trucks Initiative[1]. The Clean Trucks Initiative will incorporate revised NOx standards for on-highway heavy-duty trucks and engines, changes to onboard diagnostic requirements, cost-effective means of reassuring real world compliance by using modern and advanced technologies, the deterioration factor testing process, and concerns regarding annual recertification of engine families.

EPA intends to public a proposed rule by 2020. Because of the lead time and stability requirements found in 42 USC 7521(c), the earliest model year a new emission standard would take effect would by the model year 2024.

A nationwide approach to new engine emission standards is preferable because, as the California Air Resources Board (CARB) has stated[2], "a California-only new engine emission standard would reduce NOx emissions, but not sufficiently enough to attain federal air quality standards" in the South Coast Air Basin. Nationally, the Class 8 new truck sale market is forecasted to exceed 310,000 in 2019[3]. Meaning, the entire population of frequent and semi-frequent visiting trucks at the San Pedro Bay Port Complex constitute less than 5% of a single year of new Class 8 truck sales on a national level.

[1] https://www.epa.gov/newsreleases/epa-acting-administrator-wheeler-launches-cleaner-trucks-initiative
[2][2] https://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf
[3] https://www.truckinginfo.com/318829/ftr-ups-class-8-truck-and-trailer-forecasts-for-2019



In light of the Clean Trucks Initiative, we would recommend the port reconsider the realistic timeline for the promulgation of clear, mandatory NOx engine emission standards below the 2010 EPA model year. Because EPA has announced its intent to set new NOx engine emission standards, we do not believe it is reasonable to believe that CARB will implement an enforceable California-only NOx standard by 2019. Any such standard would not be enforceable until the issuance of a section 209 Clean Air Act (CAA) wavier.

Section 209(a) of the CAA preempts states and local governments from enacting any standard related to the control of emissions from new motor vehicles and engines. However, Section 209(b) of the CAA specifically provides a special exception for California that allows it to request a waiver from section 209(a)'s preemption, which must be granted unless the Administrator of the U.S. EPA makes certain findings. The authority of ARB, acting on behalf of California, to adopt standards related to control of emissions (i.e., emission standards) is effectively circumscribed by the waiver authority of CAA.

Ability to Ramp Up to Meet Eventual EPA/CARB Standards

The Assessment states on page 39:

Uniquely, Class 8 NZE diesel trucks could leapfrog from the current TRL 5 up to TRL 8 or 9 by 2020 (i.e., equivalent to the current level for the NZE natural gas ICE platform). However, this will require at least one heavy-duty engine OEM to successfully certify a drayage-suitable heavy-duty diesel engine to CARB's OLNS of 0.02 g/bhp-hr, or whichever NZE emissions level is ultimately adopted by CARB.

We believe this characterization discounts the likelihood that diesel ICE drayage truck manufacturers will ramp up quickly to meet future EPA/CARB mandatory emission standards. While the Assessment arbitrarily focuses on manufacturer's ability to meet CARB's optional low NOx standard (OLNS) of

0.02g/bhp-hr, there are already diesel engines testing at levels below the 0.1g/bhp-hr OLNS[4]. As discussed in the above section, EPA intends to promulgate a new truck standard by 2020 which would impact the 2024 model year at the earliest. It is not unreasonable to believe that incumbent diesel engine manufacturers will be best positioned to ramp up production to meet national standards.

Tables 36 and 37

Table 36. Diesel emissions factors for cost effectiveness analysis

	$PM_{2.5}$	NOx	ROG
Diesel Emissions Factor (g/mi)	0.01	1.91	0.04

We are unsure how the emission factors used in Table 36 were derived. We have provided the emission factors found in the EMFAC2017 technical documentation[5] for comparison. If there was an assumption about speed correction factors or deterioration made to arrive at these numbers, it would be helpful to include those for the reader.

Table 4.3-46 Revised Zero-Mile Rates (g/mi) and Deterioration Rates (g/mi/10K mi) for Diesel Heavy Heavy Duty Trucks by Vehicle Model Year†

	HC		CO		NOx		PM		CO_2	
Vehicle MY	ZMR	DR	ZMR	DR	ZMR	DR	ZMR	DR	ZMR	DR
Pre 1987	1.506	0.0343	8.043	0.183	22.98	0.019	1.7500	0.0278	2335	0
1987-90	1.183	0.0408	6.317	0.218	22.65	0.026	1.9010	0.0248	2262	0
1991-93	0.864	0.0294	2.899	0.099	19.62	0.039	0.7974	0.0145	2176	0
1994-97	0.641	0.0338	2.150	0.114	19.27	0.046	0.5241	0.0112	2086	0
1998-02	0.652	0.0336	2.190	0.113	18.95	0.053	0.5740	0.0101	2135	0
2003-06	0.546	0.0205	1.201	0.046	13.03	0.052	0.3868	0.0060	2114	0
2007	0.510	0.0167	1.105	0.036	11.47	0.048	0.2886	0.0045	2169	0
2008	0.428	0.0084	1.063	0.021	8.21	0.035	0.0380	0.0009	2343	0
2009	0.425	0.0081	1.062	0.020	8.08	0.034	0.0285	0.0008	2350	0
2010	0.365	0.0070	0.948	0.018	7.29	0.038	0.0247	0.0007	2337	0
2011	0.095	0.0017	0.428	0.007	3.66	0.057	0.0074	0.0003	2281	0
2012	0.019	0.0003	0.283	0.004	2.65	0.063	0.0025	0.0001	2265	0
2013	0.019	0.0003	0.283	0.004	2.65	0.061	0.0025	0.0001	2248	0
2014	0.019	0.0002	0.283	0.003	2.68	0.049	0.0025	0.0001	2129	0
2015+	0.019	0.0002	0.283	0.003	2.68	0.046	0.0025	0.0001	2100	0

† Emission rates are adjusted for pre-clean diesel fuel. These emission rates are corrected using fuel correction factors.

Further, it is important to note how emission factors are derived in CARB emission modeling. Table 37 makes some simplistic assumptions based on assumed tailpipe emission standards. CARB emission models typically derive zero-mile rates from their in-use testing programs. Meaning, that emission factors can increase/decrease among different model years despite the tailpipe emission standard remaining constant over those model years.

[4] See Appendix A
[5] https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf

Also, please see Appendix A regarding the assumption about the PM2.5 reduction factor between diesel and NZ CNG as the NZ CNG has a much higher PM2.5 certification level on the FTP cycle than comparable diesel engines.

Table 37. Emissions reduction factors and carbon intensity assumptions

Technology	Reduction Factor			Carbon Intensity (gCO2e/MJ)	
	NOx	$PM_{2.5}$	ROG	Traditional	Renewable/TOU
Diesel	0%	0%	0%	100.45	
NZ CNG	90%	0%	0%	79.21	39.60
BEV	100%	100%	100%	93.75	91.27

EPA last revised NOx standards for on-highway heavy-duty trucks and engines in January 2001. The Agency is not required by statue to update the standard. EPA intends to publish a proposed rule in early 2020.

Since the inception of the original CAAP, no equipment category has achieved greater emission

Please feel free to contact us with any questions.

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APPENDIX A

Sample 2019 CARB Executive Orders

MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE [1]	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS [2]	ECS & SPECIAL FEATURES [3]	DIAGNOSTIC [6]
2019	KCEXH0729XBC	11.9	CNG/LNG	Diesel	HHDD-UB	TBI, TC, CAC, ECM, EGR, TWC, HO2S	OBD(S)

PRIMARY ENGINE'S IDLE EMISSIONS CONTROL [5]	ADDITIONAL IDLE EMISSIONS CONTROL [5]
N/A	N/A

ENGINE (L)	ENGINE MODELS / CODES (rated power, in hp)
11.9	See attachment for engine models and ratings

* =not applicable; GVWR=gross vehicle weight rating; 13 CCR xyz=Title 13, California Code of Regulations, Section xyz; 40 CFR 86.abc=Title 40, Code of Federal Regulations, Section 86.abc; L=liter; hp=horsepower; kw=kilowatt; hr=hour;
[1] CNG/LNG=compressed/liquefied natural gas; LPG=liquefied petroleum gas; E85=85% ethanol fuel; MF=multi fuel a.k.a. BF=bi fuel; DF=dual fuel; FF=flexible fuel;
[2] L/M/H HDD=light/medium/heavy heavy-duty diesel; UB=urban bus; HDO=heavy duty Otto;
[3] ECS=emission control system; TWC/OC=three-way/oxidizing catalyst; NAC=NOx adsorption catalyst; SCR-U / SCR-N=selective catalytic reduction – urea / – ammonia; WU (prefix) =warm-up catalyst; DPF=diesel particulate filter; PTOX=periodic trap oxidizer; HO2S/O2S=heated/oxygen sensor; HAFS/AFS=heated/air-fuel-ratio sensor (a.k.a., universal or linear oxygen sensor); TBI=throttle body fuel injection; SFI/MFI=sequential/multi port fuel injection; DGI=direct gasoline injection; GCARB=gaseous carburetor; IDI/DDI=indirect/direct diesel injection; TC/SC=turbo/super charger; CAC=charge air cooler; EGR / EGR-C=exhaust gas recirculation / cooled EGR; PAIR/AIR=pulsed/secondary air injection; SPL=smoke puff limiter; ECM/PCM=engine/powertrain control module; EM=engine modification; 2 (prefix)=parallel; (2) (suffix)=in series;
[5] ESS=engine shutdown system (per 13 CCR 1956.8(a)(6)(A)(1); 30g=30 g/hr NOx (per 13 CCR 1956.8(a)(6)(C); APS =internal combustion auxiliary power system; ALT=alternative method (per 13 CCR 1956.8(a)(6)(D); Exempt=exempted per 13 CCR 1956.8(a)(6)(B) or for CNG/LNG fuel systems; N/A=not applicable (e.g., Otto engines and vehicles);
[6] EMD=engine manufacturer diagnostic system (13 CCR 1971); OBD=on-board diagnostic system (13 CCR 1971.1);

Following are: 1) the FTP exhaust emission standards, or family emission limit(s) as applicable, under 13 CCR 1956.8; 2) the SET and NTE limits under the applicable California exhaust emission standards and test procedures for heavy-duty diesel engines and vehicles (Test Procedures); and 3) the corresponding certification levels, for this engine family. "Diesel" CO, SET and NTE certification compliance may have been demonstrated by the manufacturer as provided under the applicable Test Procedures in lieu of testing. (For flexible- and dual-fueled engines, the CERT values in brackets [ ] are those when tested on conventional test fuel. For multi-fueled engines, the STD and CERT values for default operation permitted in 13 CCR 1956.8 are in parentheses.). [4]

in g/bhp-hr	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET
STD	0.14	0.14	0.02	0.02	*	*	15.5	15.5	0.01	0.01	*	*
CERT	0.004	0.000	0.01	0.000	*	*	1.5	0.3	0.01	0.000	*	*
NTE	0.21		0.03		*		19.4		0.02		*	

[4] g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; SET= Supplemental emissions testing; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC/HC=non-methane/hydrocarbon; NOx=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde

MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE [1]	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS [2]	ECS & SPECIAL FEATURES [3]	DIAGNOSTIC [6]
2019	KCEXH0721XAG	11.8	Diesel	Diesel	HHDD-UB	DDI, TC, CAC, ECM, EGR, OC, PTOX, SCR-U, AMOX	OBD(S)

PRIMARY ENGINE'S IDLE EMISSIONS CONTROL [5]	ADDITIONAL IDLE EMISSIONS CONTROL [5]
30g	N/A

ENGINE (L)	ENGINE MODELS / CODES (rated power, in hp)
11.8	See attachment for engine models and ratings

* =not applicable; GVWR=gross vehicle weight rating; 13 CCR xyz=Title 13, California Code of Regulations, Section xyz; 40 CFR 86.abc=Title 40, Code of Federal Regulations, Section 86.abc; L=liter; hp=horsepower; kw=kilowatt; hr=hour;
[1] CNG/LNG=compressed/liquefied natural gas; LPG=liquefied petroleum gas; E85=85% ethanol fuel; MF=multi fuel a.k.a. BF=bi fuel; DF=dual fuel; FF=flexible fuel;
[2] L/M/H HDD=light/medium/heavy heavy-duty diesel; UB=urban bus; HDO=heavy duty Otto;
[3] ECS=emission control system; TWC/OC=three-way/oxidizing catalyst; NAC=NOx adsorption catalyst; SCR-U / SCR-N=selective catalytic reduction – urea / – ammonia; WU (prefix) =warm-up catalyst; DPF=diesel particulate filter; PTOX=periodic trap oxidizer; HO2S/O2S=heated/oxygen sensor; HAFS/AFS=heated/air-fuel-ratio sensor (a.k.a., universal or linear oxygen sensor); TBI=throttle body fuel injection; SFI/MFI=sequential/multi port fuel injection; DGI=direct gasoline injection; GCARB=gaseous carburetor; IDI/DDI=indirect/direct diesel injection; TC/SC=turbo/super charger; CAC=charge air cooler; EGR / EGR-C=exhaust gas recirculation / cooled EGR; PAIR/AIR=pulsed/secondary air injection; SPL=smoke puff limiter; ECM/PCM=engine/powertrain control module; EM=engine modification; 2 (prefix)=parallel; (2) (suffix)=in series;
[5] ESS=engine shutdown system (per 13 CCR 1956.8(a)(6)(A)(1); 30g=30 g/hr NOx (per 13 CCR 1956.8(a)(6)(C); APS =internal combustion auxiliary power system; ALT=alternative method (per 13 CCR 1956.8(a)(6)(D); Exempt=exempted per 13 CCR 1956.8(a)(6)(B) or for CNG/LNG fuel systems; N/A=not applicable (e.g., Otto engines and vehicles);
[6] EMD=engine manufacturer diagnostic system (13 CCR 1971); OBD(F) / (P) / (S)=full / partial / partial with a fine / on-board diagnostic);

Following are: 1) the FTP exhaust emission standards, or family emission limit(s) as applicable, under 13 CCR 1956.8; 2) the SET and NTE limits under the applicable California exhaust emission standards and test procedures for heavy-duty diesel engines and vehicles (Test Procedures); and 3) the corresponding certification levels, for this engine family. "Diesel" CO, SET and NTE certification compliance may have been demonstrated by the manufacturer as provided under the applicable Test Procedures in lieu of testing. (For flexible- and dual-fueled engines, the CERT values in brackets [ ] are those when tested on conventional test fuel. For multi-fueled engines, the STD and CERT values for default operation permitted in 13 CCR 1956.8 are in parentheses.). [4]

in g/bhp-hr	NMHC		NOx		CO		PM		HCHO	
	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET
STD	0.14	0.14	0.20	0.20	15.5	15.5	0.01	0.01	*	*
CERT	0.01	0.01	0.17	0.16	0.4	0.00	0.004	0.003	*	*
NTE	0.21		0.30		19.4		0.02		*	

MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE [1]	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS [2]	ECS & SPECIAL FEATURES [3]	DIAGNOSTIC [6]
2019	KDDXH12.8FED	12.8	Diesel	Diesel	HHDD	DDI, TC, CAC, ECM, EGR, OC, PTOX, SCR-U, AMOX	OBD(S)

PRIMARY ENGINE'S IDLE EMISSIONS CONTROL [5]	ADDITIONAL IDLE EMISSIONS CONTROL [5]
30g	N/A

ENGINE (L)	ENGINE MODELS / CODES (rated power, in hp)
12.8	See attachment for engine models and ratings

* =not applicable; GVWR=gross vehicle weight rating; 13 CCR xyz=Title 13, California Code of Regulations, Section xyz; 40 CFR 86.abc=Title 40, Code of Federal Regulations, Section 86.abc; L=liter; hp=horsepower; kw=kilowatt; hr=hour;
[1] CNG/LNG=compressed/liquefied natural gas; LPG=liquefied petroleum gas; E85=85% ethanol fuel; MF=multi fuel a.k.a. BF=bi fuel; DF=dual fuel; FF=flexible fuel;
[2] L/M/H HDD=light/medium/heavy heavy-duty diesel; UB=urban bus; HDO=heavy duty Otto;
[3] ECS=emission control system; TWC/OC=three-way/oxidizing catalyst; NAC=NOx adsorption catalyst; SCR-U / SCR-N=selective catalytic reduction – urea / – ammonia; WU (prefix) =warm-up catalyst; DPF=diesel particulate filter; PTOX=periodic trap oxidizer; HO2S/O2S=heated/oxygen sensor; HAFS/AFS=heated/air-fuel-ratio sensor (a.k.a., universal or linear oxygen sensor); TBI=throttle body fuel injection; SFI/MFI=sequential/multi port fuel injection; DGI=direct gasoline injection; GCARB=gaseous carburetor; IDI/DDI=indirect/direct diesel injection; TC/SC=turbo/super charger; CAC=charge air cooler; EGR / EGR-C=exhaust gas recirculation / cooled EGR; PAIR/AIR=pulsed/secondary air injection; SPL=smoke puff limiter; ECM/PCM=engine/powertrain control module; EM=engine modification; 2 (prefix)=parallel; (2) (suffix)=in series;
[5] ESS=engine shutdown system (per 13 CCR 1956.8(a)(6)(A)(1); 30g=30 g/hr NOx (per 13 CCR 1956.8(a)(6)(C); APS =internal combustion auxiliary power system; ALT=alternative method (per 13 CCR 1956.8(a)(6)(D); Exempt=exempted per 13 CCR 1956.8(a)(6)(B) or for CNG/LNG fuel systems; N/A=not applicable (e.g., Otto engines and vehicles);
[6] EMD=engine manufacturer diagnostic system (13 CCR 1971); OBD(F) / (P) / (S)=full / partial / partial with a fine / on-board diagnostic;

Following are: 1) the FTP exhaust emission standards, or family emission limit(s) as applicable, under 13 CCR 1956.8; 2) the SET and NTE limits under the applicable California exhaust emission standards and test procedures for heavy-duty diesel engines and vehicles (Test Procedures); and 3) the corresponding certification levels, for this engine family. "Diesel" CO, SET and NTE certification compliance may have been demonstrated by the manufacturer as provided under the applicable Test Procedures in lieu of testing. (For flexible- and dual-fueled engines, the CERT values in brackets [ ] are those when tested on conventional test fuel. For multi-fueled engines, the STD and CERT values for default operation permitted in 13 CCR 1956.8 are in parentheses.). [4]

in g/bhp-hr	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET
STD	0.14	0.14	0.20	0.20	*	*	15.5	15.5	0.01	0.01	*	*
FEL	*	*	*	*	*	*	*	*	*	*	*	*
CERT	0.000	0.002	0.06	0.02	*	*	0.9	0.01	0.000	0.000	*	*
NTE	0.21		0.30		*		19.4		0.02		*	

[4] g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; SET=Supplemental emissions testing; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC/HC=non-methane/hydrocarbon; NOx=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde;

Cummins Westport
The Natural Choice

January 21, 2019

San Pedro Ports
Clean Air Action Plan

RE: Comments on Draft 2018 Feasibility Assessment for Drayage Trucks

Submitted via: caap@cleanairactionplan.org

Cummins Westport Inc. (CWI) would like to provide the following comments on the draft 2018 Feasibility Assessment for Drayage Trucks (Feasibility Assessment) released on December 18, 2018 as part of the Clean Air Action Plan (CAAP). CWI designs and manufacturers natural gas engines certified by the California Air Resources Board (CARB) to optional low NOx standards. The engine primarily applicable for drayage applications is the ISX12N model which is CARB certified at the 0.02 g/bhp-hr NOx emission level.

In general, CWI finds the Feasibility Assessment to be consistent with our evaluation of current technology readiness. We offer the following comments and recommendations where we take exception and/or would like to provide clarification in a particular area. We have limited our comments to the assessment of the ISX12N natural gas engine. Unfortunately, many discussions related to various technologies have degraded into a "winner take all" position and attacks on "competitive" powertrains.

Fleet operations, both within and outside drayage, are a complex mix of many factors. As such, there is no one-size-fits-all solution. Using a minimum performance standard philosophy will allow various technologies to compete and come to market as they mature.

Definition of Near-Zero-Emission (page 10):

- CARB and EPA have adopted a 0.20 g/bhp-hr NOx standard as the maximum allowable for heavy-duty combustion engines. Although not specifically called out as such, industry has generally accepted that the CARB optional low NOx standard (OLNS) of 0.02 g/bhp-hr NOx as near-zero.
- The CAAP ties the implementation of a rates/registration requirement to the CARB adoption of a NOx standard lower than the current 0.20 g/bhp-hr. Since the CARB OLNS is enforceable at the established lower level, there is no reason to wait for CARB to promulgate a lower "base" emission standard.
    - Although CARB has begun the regulatory process to promulgate a lower base emissions standard, there is no guarantee that one will be established.

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- Assuming a lower base emissions standard is promulgated, CARB timelines tend to slip, which will delay deployment of cleaner trucks into the Ports.

Wall Plugs (page 12): Using the term "charged via wall plugs" could lead a reader to imply that electric drayage trucks could be recharged using standard 120/240V outlets. Suggest rewording to "conductively via fixed charger or inductively charged".

Initial ISLG deployment into Drayage applications (page 15): Report correctly identifies that the ISLG engines deployed into port drayage were undersized for the application and that the ISX12G/N engines are more appropriately sized.

ISX12N availability (pages 21/22): The 12N is available from five Original Equipment Manufacturers (Freightliner, Kenworth, Mack, Peterbilt and Volvo). The 12N is currently not available in an International/Navistar platform.

ISX12N suitability in drayage applications (page 25): Report incorrectly states that only 22 ISX12N engines are in drayage service and "they are still undergoing proof of feasibility testing."

- Feasibility testing was completed prior to engine certification in late 2017 and commercial launch in 2018.
- The ISX12N units currently operating under the SCAQMD/CEC demonstration were intended to dispel the impression by some fleet operators that natural gas engines are underpowered created by the ISLG experience.
- The Near-Zero emissions from the ISX12N are due to evolutionary improvements of the ISX12G engine.
- Over 2,100 ISX12N engines were produced in 2018, in addition to the thousands of ISX12G engines in service.

Natural gas demonstrations (pages 28/29): Feasibility Assessment incorrectly states, "Notwithstanding the major progress, even the most-advanced of the NZE platforms has not yet transitioned into full commercial status for Class 8 trucking in the San Pedro Bay Ports drayage service."

- Although operational and driver experience data is being collected on 20 specific ISX12N trucks, the ISX12N engine is in full commercial production by Cummins Westport and available through five different OEMs.
- The ISX12N engine is available and integrated into the standard ordering process of each of the OEMs without any minimum build quantity requirement.
- The ISX12N engine is built interspersed on the same line production line in Jamestown, NY as the diesel X12 and X15 engines.

- From conversations with fleets, the major limiter to adoption of the technology is due to inaction by the Ports. In other words, fleets are waiting to see what the Ports implement before making any financial commitments.
- TTSI is currently out for bid for 50 ISX12N equipped trucks which would indicate full commercial confidence in the product by a major drayage operator.

2021 OEM availability (page 32): Feasibility Assessment indicates that some of the current five OEMs will discontinue the ISX12N as an option by 2021. CWI has no indication from our OEM partners that will be the case.

Technology Readiness Level (TRL) (page 39): The ISX12N engine, and associated fuel systems, are in full commercial production as a standard product offering by five OEMs. Although 20 units are being monitored, they are not "undergoing real-world system conditioning". We agree with the CARB assessment contained on page 42 that "the emergence of this engine (ISX12N) as a commercial product brings low NOx technology to drayage, regional delivery and some line haul applications". Therefore, we believe the ISX12N should be classified as TRL 9.

Range degradation (page 61): Feasibility Assessment states, "In the case of natural gas trucks, range will decrease as its fuel economy decreases due to engine and driveline wear." No fleets, who follow the recommended maintenance for the engine, have reported any degradation of fuel economy due to wear of the engine and driveline. Driver variability and duty cycle have by far the largest impact on fuel economy. Assuming this is true for the sake of discussion, this degradation would be equivalent to the baseline diesel experience.

Economics (page 97): Feasibility Assessment states, "Currently, only one manufacturer offers a near-zero natural gas engine suitable for drayage, hence there is no direct competitive pressure to reduce equipment costs below current levels." By far the incremental cost above the diesel baseline is due to the fuel storage tank system and not the natural gas engine. There are multiple companies competing and offering natural gas storage solutions. Additionally, the five OEMs compete for business of the truck itself.

In summary, CWI firmly believes the ISX12N engine should be classified as TRL 9 for the following reasons:
- ISX12N engine has been fully commercialized and integrated into major OEM truck chassis designed for regional hauling applications, such as drayage.
- ISX12N engines are built on the same production line in Jamestown, NY as similar Cummins diesel engines with no minimum order quantity.
- ISX12N engines are supported (warranty, service and parts) through the existing Cummins distributor, OEM dealer and independent dealer network.

- Over 2,100 ISX12N engines have been deployed into service in 2018 and commercially accepted by fleet operators.

Although not directly related to the Feasibility Assessment, CWI offers the following recommended actions:

- Ports should not wait for CARB action to promulgate a lower "base" emission standard.
- Ports should move forward to implement a fee/registration requirement using the OLNS of 0.02g or better NOx level without choosing a winning technology. The market will naturally determine which technology meets the operational and financial requirements associated with various duty cycles and operations.
- As one would expect, fleets are waiting for the Ports to set their requirements before investing in any new technology. Delay in action by the Ports only delays deployment of cleaner technology.

CWI wants to support the CAAP toward a cleaner environment. Feel free to reach out to me directly at 916-709-9562 or tom.swenson@cummins.com if I can be of any further assistance.

Best regards,

Tom Swenson
Business Development Manager

January 30, 2019

Chris Cannon
Port of Los Angeles
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San Pedro, CA 90731

Heather Tomley
Port of Long Beach
4801 Airport Plaza Dr.
Long Beach, CA 90815

Submitted via: caap@cleanairactionplan.org
Re: Draft 2018 Feasibility Assessment for Drayage Trucks

Dear Ms. Tomley and Mr. Cannon:

On behalf of the organizations listed below, thank you for the opportunity to provide comment to the draft *2018 Feasibility Assessment for Drayage Trucks*, released 12/18/18.

We strongly support the San Pedro Bay Ports' Clean Air Action Plan (CAAP) commitment to transition the entire on-road drayage truck fleet serving the ports to zero emissions by 2035. Further, as individual members of the *Transportation Electrification Partnership*, convened by the Los Angeles Cleantech Incubator (LACI), which aims to reduce greenhouse gas emissions and air pollution in the greater Los Angeles region by accelerating transportation electrification between now and the upcoming Olympic and Paralympic Games, we support an interim goal for 10-40 percent of all drayage trucks on the road in the region to be zero emissions by 2028, ensuring that steady progress is made toward the CAAP 2035 goal.[1]

We appreciate the effort undertaken to prepare the draft *Feasibility Assessment* and the desire "to identify the state of near-zero and zero-emissions technologies, potential challenges to meeting the goals, opportunities for earlier penetration of the cleanest trucks, and to inform…progress throughout the implementation period."[2]

Upon review of the draft Feasibility Assessment, we offer the following comments and recommendations:

1. **Work backward from CAAP 2035 goal to ensure success.**
Given that the *Feasibility Assessment* will send important signals to the market, we believe that it is important to outline a path for achieving the 2035 goal. We recommend in the final version to chart out the percentage of trucks that need to be zero emissions each year in order to achieve a full fleet transition so that all parties can be working together to determine *how* to achieve these annual milestones and the 2035 goal.

[1] Los Angeles Cleantech Incubator, Zero Emissions 2028 Roadmap, (September 2018), 17.
[2] Port of Long Beach and Port of Los Angeles, Final Clean Air Action Plan Update, (November 2017), 38.

2. Incorporate latest information from industry on current and future offerings.
LACI, together with the Port of Long Beach, Port of Los Angeles, California Air Resources Board and the California Energy Commission, issued a Request for Information on Zero Emissions Trucks, Infrastructure and Pilot Projects in fall 2018, receiving nearly 40 submissions from a diverse set of parties. LACI will be sharing the full results with the RFI partners in February, and making a digest available to the public in late February/early March.[3] Given the timing, we recommend incorporating any relevant insights on the development of zero emissions truck/infrastructure from the RFI analysis into the final version of the *Feasibility Assessment* to ensure that it reflects the latest industry information.

3. Invest in zero emissions trucks where possible.
As acknowledged in the *Feasibility Assessment*, the zero emissions truck market is developing rapidly with early commercial and pre-commercial demonstrations underway. Given that, we are concerned that the conclusions of the draft *Feasibility Assessment* may result in unnecessarily heavy investment in near-zero emissions vehicles in the short-term; such investment could lead to stranded assets and require more work to be done in later years in order to meet the 2035 goal.

We suggest including into the final version a note that many fleets have duty cycles for which zero-emissions technology makes sense today. A zero emissions truck need not be able to travel 500 miles on a charge to operate in daily local drayage at the San Pedro ports, and there is a present opportunity for fleets to phase in the use of battery electric drayage trucks on their shorter routes. While incorporating battery-electric trucks would require fleets to reevaluate operations, it would accelerate the transition to a zero emissions fleet.

4. Don't underestimate investment in electric vehicle infrastructure.
As Southern California Edison has been approved by the California Public Utilities Commission (CPUC) to invest $356 million in the development of electric vehicle charging infrastructure for trucks, buses and other industrial vehicles over the next five years,[4] the quarter circle allocated to *Infrastructure Capital and Operational Costs* for zero emissions battery-electric trucks is too low.[5] Likewise, the designation of a full circle in this same category for near-zero emissions natural gas internal combustion engines is inflated given the energy costs associated with compressing natural gas. Adjustments in this category would have an important impact on the overall *Economic Workability* rating of these vehicle types.

5. Incorporate local workforce development opportunities.
Thank you for including workforce impacts in the draft *Feasibility Assessment* and for conducting additional studies to more fully assess potential workforce impacts. We look forward to reviewing Long Beach City College's zero-emissions workforce assessment in early 2019 and the Port of Long Beach's "Port Community Electric Vehicle Blueprint" in June 2019. In addition to reviewing any associated training costs, we encourage you to also weigh workforce development opportunities, such as companies siting their operations in the Southern California region to leverage the existing base of transportation electrification companies.

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[3] LACI, Zero Emissions Trucks for Goods Movement RFI, September 5, 2018.

[4] Emma Foehringer Merchant, "California Regulators Approve Landmark Utility EV-Charging Proposals," (Greentech Media), May 31, 2018.

[5] Port of Long Beach and Port of Los Angeles, Draft 2018 Feasibility Assessment for Drayage Trucks, (December 2018), 7.

6. **Update the *Feasibility Assessment* annually.**
Given the rapid pace with which the zero emissions truck market is developing and the number of variables at play, we propose that the *Feasibility Assessment* be updated on an annual basis, rather than every three years as required by the CAAP, to more accurately account for progress (incorporating the learnings from pilot and demonstration projects) and game-changers that are on the horizon (i.e. battery range, battery costs, battery supply, cost of ownership), and to better inform future investments.

In conclusion, we thank you for the draft *Feasibility Assessment* and recommend that you incorporate the proposals above to ensure that the final version reflects the latest industry information and the quickly developing state of the zero emissions truck market.

We look forward to working with you to ensure the success of the CAAP 2035 goal and a zero emissions future!

Sincerely,

Michelle Kinman
Director of Transportation
Los Angeles Cleantech Incubator

Vic Shao
CEO
Amply Power, Inc.

Vincent Pellecchia
Strategic Account Manager
BYD Motors LLC

Thomas Ashley
VP, Policy
Greenlots

Luke Scheidler
Sr. Product Manager, New Business Innovation
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Gary Gero
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Los Angeles County

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Southern California Edison

Francesca Wahl
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January 4, 2018

Port of Los Angeles
Chris Cannon, Director Environmental Management
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Subject: Draft 2018 Feasibility Assessment for Drayage Trucks Comments Submittal

To whom it may concern,

The policy and investment likely to result from the Ports' Truck Feasibility Assessment will greatly influence policy decisions and investments throughout the US and even beyond by driving economies of scale, market dynamics, and advancing technological capability. I thank you greatly for requesting Comments and note that the current Draft Feasibility Assessment is based on static parameters which will drive planning limited to specific technologies and economics that may prove ill-advised as engineering advancements and changes in fuel and infrastructure costs evolve.

The Study must provide evaluations of multiple scenarios for phased implementations of different fuel technologies, even simultaneously in varying mixes, and must not focus on limited implementation models, such as the current 11,000 Broadly Applicable Truck population. The costs modeled in the Study must be considered variable due to evolving economic conditions and not limited to single scenario calculations such as the Total Cost of Ownership based on 12 years, fixed costs of fuels and batteries, hydrogen production, and electric utility rates.

The work of the Study must continue as an uninterrupted, on-going effort to update affected sections as technology advances and economic forecasts change. The Study must be considered a dynamic and living document with revisions to be issued with the quarterly Clean Air Action Plan updates, next planned for 1st Quarter 2019.

Please also consider the concern that, as trucks are the greatest contributor to Greenhouse Gas emissions at the Port of Los Angeles and a top contributor at Long Beach, the production, storage, and transfer of natural gas releases methane, a significant and long-lasting Greenhouse Gas. Any calculations of the benefit resulting from reduction in tail pipe emissions from Natural Gas fuel technologies must include consideration of the increased methane release, estimated at between two and three percent of natural gas consumed.

Please consider the following four examples as potential efforts to broaden the evaluation to multiple Assessment scenarios as suggested above which could be performed through pro-forma spreadsheet software.

Examples of Multiple Feasibility Assessment Scenarios

1) Model varying quantities of truck fuel technology platforms among the fleet of frequent and infrequent truck populations. Among the complete fleet of trucks, evaluation of discreet quantities by technology type provides broader perspective with different numeric outcomes through varying the quantities in each fuel-technology platform. Cost projections must be modeled based on the multiple fuel technology mix scenarios.

2) Provide varying time period projections for Total Cost of Ownership allowing for different financing and capital expense strategies and planning.

3) Calculate cost outcomes based on multiple scenarios as the costs associated with each fuel technology and infrastructure is likely to vary and are subject to changes. For example, the electricity charge estimated for Department of Water and Power may be reduced substantially based on an Electric Vehicle rate, the cost of Natural Gas may rise substantially, and advancements in hydrogen production will drastically reduce the cost of fuel cell power.

4) Evaluation must be included of the potential impacts from a marginal container fee to fund California State Ports' leadership in the transition to cleaner technology, which may greatly affect Total Cost of Ownership through increased incentives and subsidies possible through a shipping fee implemented state-wide.

I request your consideration of and response to the above recommendations.

Thank you.

Richard Havenick
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Copies to: Office of Janice Hahn, Los Angeles County Supervisor Fourth District; Office of Joe Buscaino, City of Los Angeles Council District 15

SOUTHERN CALIFORNIA
EDISON
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January 30, 2019

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Submitted online to caap@cleanairactionplan.org

Re: Comments on the San Pedro Bay Ports' Draft 2018 Feasibility Assessment for Drayage Trucks

Dear Ms. Tomley & Mr. Cannon:

Southern California Edison (SCE) appreciates the opportunity to comment on the Draft 2018 Feasibility Assessment for Drayage Trucks. SCE is proud to be a partner with the customers and communities in our service territory to facilitate zero-emissions (ZE) technologies, improve air quality in our region and make meaningful progress towards reaching our climate targets. As an infrastructure provider and facilitator of ZE technologies, SCE looks forward to working with the Ports to continue to provide input on the transition to a ZE future in support of the Clean Air Action Plan (CAAP) greenhouse gas (GHG) targets and transition to all ZE drayage trucks by 2035 and all ZE terminal equipment by 2030.

Battery electric vehicles provide the largest opportunity to reduce greenhouse gases and criteria air pollutants.

The report's assessment of the relative emissions profiles of near-zero emissions (NZE) and zero-emissions (ZE) medium- and heavy-duty (MDHD) vehicles and the associated cost-effectiveness of environmental benefits is not accurate. The report cites Compressed Natural Gas (CNG) and Renewable Natural Gas (RNG) as both having more favorable carbon emissions intensities (CI) as compared to electric vehicles. When necessary corrections are made, ZE battery electric MDHD vehicle technologies are dramatically less GHG-intensive: 66% less carbon-intensive when compared to RNG and 85% less when compared to CNG.

Table 37 in the report, "Emissions reduction factors and carbon intensity assumptions," shows natural gas-fueled vehicles as being from 16% to 58% less GHG-intensive than battery electric vehicles.[1] The CI assumption for ZE vehicles is based on California's average state-wide grid electricity supplied to electric vehicles. SCE's grid is comparably cleaner than the state-wide grid, having a carbon intensity of 66.65 gCO2e/MJ compared with the cited state-wide average of 93.75 gCO2e/MJ.[2]

In comparing relative emissions profiles of alternative fuels as they displace conventional fossil fuels, it is important to adjust CI values by the Energy Economy Ratio (EER) to account for the efficiency of the alternative fuel as compared to a reference fuel used in the same powertrain. These values have a significant impact in evaluating the relative CI of alternative fuel options. While the cited CI numbers for natural gas account for an efficiency penalty for spark-ignition natural gas engines compared to compression-ignition diesel engines, the same EER correction has not been applied to the electricity CI numbers taking advantage of the efficiency boost from electric powertrains.[3]

When these two corrections are made, MDHD electric vehicles fueled by SCE's grid are 66% less GHG-intensive than RNG-fueled vehicles and 85% less GHG-intensive than CNG-fueled vehicles.[4] These adjustments present a dramatic reversal of the report's cited emissions profiles purporting NZE vehicles to be less GHG-intensive. As SCE's grid continues to get cleaner with even more renewable energy, the GHG benefits of electric vehicles over CNG- and RNG-fueled vehicles grows even wider with every year. A study by the Union of Concerned Scientists found GHG emissions from electric trucks and buses to already be lower than both diesel and natural gas across the country.[5] Electric heavy-duty vehicles are also 93 percent cleaner on NOx when charging on SCE's grid.[6]

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[1]Pg. 95 in the DRAFT 2018 Feasibility Assessment for Drayage Trucks

[2]Based on SCE's CO2e emissions from delivered electricity in 2016, 66.65 gCO2e/MJ, pg. A-31, http://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A1806015/1620/219474631.pdf.

[3]CARB describes this methodology in the Low Carbon Fuel Standard regulation: "For comparison on an equivalent basis (gCO2e per MJ of conventional fuel displaced), the CIs listed in Tables 7-1 and 7-2 must be divided by the EER in Table 5 for the appropriate fuel-vehicle combination." https://www.arb.ca.gov/regact/2018/lcfs18/frolcfs.pdf?_ga=2.48961634.591313094.1548526138-1823936443.1523905092

[4]Carbon Intensity cited in Table 37 (pg. 95) of the report for CNG is 79.21 gCO2e/MJ and 39.60 gCO2e/MJ for RNG. Values cited for charging BEVs in Table 37 are 93.75 and 91.27 gCO2e/MJ. This initially purports a 16% to 58% carbon intensity *improvement* of using natural gas fuels over electricity from the grid. When necessary EER adjustments are taken into account per the methodology described by CARB, the resulting CI for CNG is 79.21/0.9 = 88.01 gCO2e/MJ to account for the efficiency penalty of spark-ignition natural gas engines. The value for RNG is cited as coming from the "LCFS Dashboard" which displays values that have already been EER-adjusted so that value can remain at 39.60 gCO2e/MJ. Charging with electricity from SCE's grid and accounting for the EER adjustment of 5 for BEV Trucks (found in Table 5 of the LCFS Final Regulation Order) yields a CI for BEVs of 13.33 gCO2e/MJ (66.65/5 = 13.33), an 85% improvement over CNG when compared to the EER-adjusted value of 88.01 gCO2e/MJ and a 66% improvement when compared to RNG at 39.60 gCO2e/MJ.

[5]Union of Concerned Scientists, "Electric Trucks and Buses, Solutions for Climate Change and Air Pollution" https://www.ucsusa.org/sites/default/files/images/2018/09/electric-buses-trucks.pdf

[6]0.02 grams per brake horsepower-hour (g/bhp-hr) Low-NOx engine compared to in-basin upstream power emissions at 0.001343 g/bhp-hr. Production simulation modeling for in and out-of-basin emissions by SCE resulted

Electrification in the transportation sector remains the most cost-effective path to simultaneously improve air quality and set us on a path to reaching climate targets.

In order to ensure alignment in near-term decision-making with long-term achievement of goals, it is important that the Ports' trajectory and assessment of alternative vehicle and fuel options adopt a long-term approach regarding the path to the CAAP's 2030 & 2050 GHG targets and 2035 ZE truck goals. The cost-effectiveness of reaching CAAP goals and targets must be assessed in the broader context of improving air quality and cutting greenhouse gases in alignment with the air quality needs of the region and the State's climate targets.

SCE examined various technology pathways, including RNG, hydrogen, and electrification, for achievement of these goals, using relative abatement potential and costs, feasibility (availability of technology, infrastructure requirements, economies of scale, consumer preference, timing of deployment), and an assessment of stranded asset risk.

In this assessment, electrification was the most cost-effective path.[7] Similar conclusions are echoed in other studies in which, among alternative vehicles and fuel choice options, electrification was the most cost-effective alternative achieving a total overall set of emissions reductions.[8]

The issues presented in the report's GHG analysis and associated cost-effectiveness present a limited, short-term snapshot assessment upon which to base further strategy on achieving the goals and targets in the CAAP. The report does not adequately advise on the most cost-effective option to improve air quality, reduce greenhouse gases, and achieve the Ports' 2030 and 2050 GHG targets and 2035 ZE drayage truck goals in alignment with air quality and climate needs in the region and State.

Interim near-term goals for ZE vehicles draws a more certain path to achieving longer-term 2035 ZE truck goals and 2030 and 2050 GHG targets.

Approaches that accelerate the transition to NZE trucks in the short-term and delay ZE truck deployment to outer years present significant risk in reaching the Ports' ZE truck goals and GHG targets. Near-term underinvestment in the pilot programs, demonstrations, and early action in ZE

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in 0.001801 grams per kilowatt hour (g/kWh) of NOx from electric generation in the South Coast Air Basin. At 1.341 horsepower per kWh, emissions from power plants resulting from EV charging would emit an equivalent of 0.001343 g/bhp-hr. From SCE's filing with the CPUC in support of 2017 SB 350 Transportation Electrification Proposals, pg.59, http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/649E8D79409814778825816F0081AB46/$FILE/A1701021-SCE-01A-%20Amended%20TE%20Testimony-Full%20Copy.pdf

[7]Southern CA Edison, "The Clean Power and Electrification Pathway," https://www.edison.com/home/our-perspective/clean-power-and-electrification-pathway.html

[8]The International Council on Clean Transportation (ICCT), "Transitioning to Zero-Emission Heavy-Duty Freight Vehicles," https://www.theicct.org/sites/default/files/publications/Zero-emission-freight-trucks_ICCT-white-paper_26092017_vF.pdf

vehicle and infrastructure deployment could inhibit the Ports' ability to reach its ultimate goals. While "Infrastructure Availability" is discussed in the report, this risk of underinvestment in ZE technology in the near-term undermining the achievement of long term goals is not discussed.

Appropriate significant action on MDHD electrification is necessary now in order to lay the important groundwork and set the Ports on a path to ultimately reaching CAAP goals and contributing to the region's air quality goals and California's climate change targets. Overinvestment in natural gas NZE vehicles, and associated required infrastructure buildout, risks a more costly, fuel supply-constrained option, with less environmental benefit and significant stranded asset risk.

A "softer landing" could be achieved with a staged, phased-in approach that commits to meaningful and significant near-term action and investments in ZE to achieve a more orderly, less economically disruptive transition. The greater macroeconomic and risk-mitigating benefits in meaningful, ambitious early incremental actions in a "softer landing" approach compared to delayed, sweeping action in "hard landing" approaches have been discussed in the literature of technology turnover in decarbonizing economies.[9]

The largest contributor of port-related GHG emissions are port trucks, which represent 40% of total port-wide GHG emissions.[10] It is therefore important to set near-term, interim goals for ZE truck deployment to ensure a softer landing.

A simple straight-line from 2035 back to the present using the report's estimated required drayage fleet size ranging from 11,000 to 18,000 trucks, would require annual vehicle turnover of 650 to 1,060 trucks to meet the 2035 ZE truck goal. This benchmark highlights the important need for ambitious, early action to electrify where feasible where duty cycles allow. Not every truck will be ready to electrify in the near-term, but cases where particular duty cycles or uses present near-term appropriate opportunities to electrify should be sought and taken in early years.

Every truck that electrifies where feasible in the near-term reduces the overall cost of the pathway and softens the landing in reaching CAAP targets. The Ports should examine and set interim targets that chart a course to reaching 2035 targets, e.g., 2,000 ZE trucks by 2024. It is important to set interim targets and goals to benchmark progress and encourage early action that takes advantage of existing incentives, utility infrastructure programs, and favorable commercial EV rates that are currently launching this year and will be available over the next five years. Waiting until later years bears significant risk.

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[9]European Systemic Risk Board, European System of Financial Supervision, "Too late, too sudden: Transition to a low-carbon economy and systemic risk"
https://www.esrb.europa.eu/pub/pdf/asc/Reports_ASC_6_1602.pdf

[10]The Ports' 2017 Clean Air Action Plan Update, http://www.cleanairactionplan.org/documents/final-2017-clean-air-action-plan-update.pdf/

<u>The scaling of electric infrastructure has been approved with significant funding, concrete near-term timelines (2019-2023), and number of vehicles supported.</u>

The report gives a lower rating to "Infrastructure Availability" for ZE vehicles compared with NZE vehicles, not taking into account the level of investment currently at work in the State to provide infrastructure to electrify the transportation sector in the near-term.[11] Last year, the State invested over $700 million for supporting charging networks for electric vehicles.[12] SCE was approved for $356 million over five years (2019-2023) to support infrastructure investments at 870 sites to support the electrification of 8,500 medium- and heavy-duty vehicles. Expanding MDHD vehicle charging networks supported by an increasingly cleaner electrical grid, supports technologies that will continue to improve air quality, and helps California achieve both 2030 and 2050 GHG targets, with low risk of stranded investment on the path to decarbonizing California's economy.

<u>Accounting for incentives shows increasingly favorable economics for ZE trucks in SCE's service territory.</u>

The aim of incentives is to spur technological change in the large-scale transformation of the transportation sector. In the report, the economics of electric trucks grew more favorable when incentives were accounted for, such as: State funding opportunities and incentives, utility programs for electrical infrastructure needs, and innovative new rate designs to support vehicle electrification, as well as additional revenue from Low Carbon Fuel Standard (LCFS) credits.

The report states, that "to be conservative, it is recommended that economic workability be based on non-incentivized cost of ownership" and recommends discounting the value of incentives.[13] It is important to acknowledge that these incentives do not exist in a vacuum, but rather in a greater policy context. Annual funding allocations ultimately serve codified State and regional policies within an overall policy strategy to guide funding to incentives and programs that spur technological change in the service of ambitious long-term, multi-year air quality and climate goals. SCE's own strategy around transportation electrification programs is guided by a corporate vision in line with achieving those same air and climate goals.

The State's cap and trade program extension and LCFS in place until at least 2030 are unambiguous market signals of sources of revenues to be directed to support transition to cleaner resources over the next decade. There are significant resources, commitment, and dedication from a variety of sources to ensuring the continued growth of transportation electrification as they serve a critical role in achieving air quality and climate targets.

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[11]Pg. 71 in the DRAFT 2018 Feasibility Assessment for Drayage Trucks
[12]California, New York, New Jersey see nearly $1.3B in new EV funding, *Utility Dive*
https://www.utilitydive.com/news/california-new-york-new-jersey-see-nearly-13b-in-new-ev-funding/524757/
[13]Pgs. 91 and 93 in the DRAFT 2018 Feasibility Assessment for Drayage Trucks

<u>The report should be updated annually to take stock of rapidly advancing ZE technology market developments.</u>

The report provides a snapshot projecting how the next three years will unfold. If the past three years are an indication, it is clear that the ZE MDHD vehicle market is evolving faster than expected. The report notes how critical the next few unfolding years are in terms of the availability of ZE drayage truck models on the market.[14] New models may challenge prior technology and performance assumptions, with unexpected progressions, presenting compelling technological and economic cases for accelerating adoption in the marketplace. It is important to take stock of these developments to adequately inform policy decision-making in reaching 2035 ZE goals and 2030 and 2050 GHG targets. Additionally, this year SCE is launching its Charge Ready Transport (MDHD infrastructure program) and rolling out favorable commercial EV rates over this timeframe (2019-2023). Over this timeframe, SCE will be scaling up infrastructure to support the electrification of 8,500 MDHD vehicles in the region.

We recognize this is a start and that there will be further opportunity to provide input on this document and the CAAP process. We thank the Ports' staff and preparers of the report for the opportunity to review and provide our comments. SCE supports the Ports' transition to a zero-emissions future and looks forward to supporting customers through the transition to modes of transportation that align with the shared goal of a sustainable transportation network, with increasing numbers of electric vehicles on the road, improving air quality in the region while cutting greenhouses gases helping to meet California's goals, and continuing to contribute to the economic growth of our region.

Thank you for considering our comments and we look forward to finding solutions together to achieve a zero-emissions future for the benefit of our communities and customers, the region, and the State.

Sincerely,

Laura Renger / VK

Laura Renger
Principal Manager, Air & Climate Policy
Southern California Edison

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[14]Pgs. 8-9 in the DRAFT 2018 Feasibility Assessment for Drayage Trucks

January 30, 2019

Port of Los Angeles
425 S Palos Verdes St
San Pedro, CA 90731

Port of Long Beach
4801 Airport Plaza Drive
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RE: Draft 2018 Feasibility Assessment for Drayage Trucks Released by San Pedro Bay Ports

To Whom It May Concern,

Tesla appreciates the opportunity to submit comments on the Draft 2018 Feasibility Assessment for Drayage Trucks (Assessment) released by the San Pedro Bay Ports (Ports) in December 2018. In the comments below, Tesla highlights several components of the Assessment that should be reconsidered including economic workability, operational feasibility and commercial availability, and the emissions offset capabilities. Tesla also requests further clarification on the purpose of the Assessment.

Tesla is an American manufacturer of the world's most advanced electric vehicles and battery energy storage systems. Today, Tesla is one of the largest manufacturing employers in California with nearly 20,000 employees in the state, including more than 10,000 at Fremont where all Tesla vehicles are assembled, including Model 3, which is designed and built as the world's first mass-market electric vehicle. While most known for its best-in-class vehicles, Tesla has also been investing in a global infrastructure network of EV charging stations. On November 16, 2017, the company unveiled the Tesla Semi, an all-electric Class 8 vehicle with 300-500 miles of range.

I. The Purpose of the Assessment Should be Clarified

As explained in the Feasibility Assessment and in the Ports 2017 Clean Air Action Plan (CAAP) Update, the CAAP requires the Ports to conduct a Feasibility Assessment every three years, which is "intended to consider whether the Ports are on track to meet CAAP goals."[1] However, it is not entirely clear how the Ports will determine if they are on track to meet goals that largely go into effect in 2023 and 2035 based off 2018-2021 data. Tesla agrees with the Assessment's assertion that "importantly, the Assessment represents a snapshot in time and is not intended to preclude or discourage expanded development, demonstration and deployment of zero-emission (ZE) and near-zero-emission (NZE) fuel-technology platforms that have not yet reached sufficient technological and commercial maturity to be deemed feasible."[2] Tesla would like further clarity on how these assessments will be used by the Ports, and if these early assessments will be used to modify or evaluate the long term CAAP goals.

II. Base Consideration Conclusions Should be Reconsidered

The Assessment makes a series of conclusions within the parameters of economic workability, operational feasibility, availability of infrastructure and fuel, and technical viability that result in a lower overall score for ZE Battery-Electric than NZE natural gas internal combustion engines (NG ICE). Additional clarity on the underlying assumptions is needed to justify the conclusions made by the Assessment. Tesla recommends that the Assessment reconsider some of these findings and the resulting conclusions given the feedback below.

[1] http://www.cleanairactionplan.org/documents/feasibility-assessment-framework.pdf/
[2] Draft Feasibility Assessment, p.1.

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a. Economic Workability

The Assessment's overall conclusion ranks ZE Battery-Electric at 25% achievement compared to traditional ICE vehicles, and NZE NG ICE at 75% achievement. While total cost of ownership (TCO) is discussed in the report including Table 35 and Figure 13, it is difficult to determine from the information provided in the assessment the specific calculations utilized for each component that makes up the TCO. One helpful comparison for this draft assessment would be to convert TCO into a dollar per mile metric.

Furthermore, the Assessment makes several assumptions that skew the TCO results for ZE Battery-Electric such as assuming a high incremental vehicle cost for ZE Battery-Electric and the inclusion of infrastructure build out, which is assumed to be zero cost for NG vehicles. In the sections below, we discuss several of the specific assumptions utilized to determine the comparative cost of ownership analysis that merit further evaluation.

Incremental Vehicle Cost

The draft assessment finds that the "upfront capital cost for the new technology" of ZE Battery-Electric is at 25% achievement, compared to a 75% achievement for the NZE NG ICE. The conclusion assumes $300,000 for an electric class 8 truck, and $605,000 for a 600-mile range electric truck.[3] The Tesla Semi is not included in this assessment but is mentioned in the commercial assessment section. In fact, the Tesla Semi has a base price of $150,000 for the 300 mile range model and $180,000 for the 500 mile range model. This falls far below the $605,000 estimate in the Assessment. Thus, Tesla recommends updating the price to something far lower, likely close to the price for the Tesla Semi, and expanding the electric truck models that are considered in this section to include the Tesla Semi and other models, which would reduce the average cost.

Fuel, Operational, and Maintenance Costs

The Assessment evaluates fuel price by comparing current rates at Southern California Edison (SCE) and Los Angeles Department (LADWP). Because LADWP does not currently have an EV-related rate, the charging costs were found to be roughly double the costs of charging at SCE, and markedly higher than any other fuel cost. It is difficult to predict potential rate changes out to 2021, however, LADWP in this timeframe, could determine that an EV-specific rate is necessary to meet a changing need. The Assessment should therefore consider the impact of potential rate changes over the next three years for each applicable utility territory.

Furthermore, it does not seem that this Assessment accounted for the fact that fleets can control scheduling and charging of vehicles to achieve high charger utilization and spread demand charges across a large number of kWh. Tesla recommends investigating this further in the Final Assessment.

Infrastructure Capital and Operational Costs

The Assessment relies on a California Air Resources Board (CARB) estimate of $105,000 per 60 kW DC fast charger including installation to determine infrastructure cost. This, however, does not account for the potential variation of costs for installation and make-ready infrastructure depending on driver charging use cases, facility capacity, utilization and other factors. SCE and Pacific Gas and Electric as noted in the report per D.18-05-040 have been approved to invest funding in infrastructure for electric heavy-duty trucks among other items. These programs, which will begin in 2019/2020, provide another near-term opportunity to assess infrastructure costs for ZE Battery-Electric. The changing cost implications, especially on the infrastructure side, may provide a compelling case for updating the Assessment regarding TCO comparisons prior to 2021. Tesla also recommends that the Final Assessment solicit additional input from other EVSE manufacturers regarding expected infrastructure costs and needs.

[3] Draft Feasibility Assessment, pp. 84-85.

Finally, under the assumptions in the current cost analysis it determines that zero additional cost will be incurred for infrastructure deployment for LNG and CNG in the near term. It would be useful, to provide a more apples to apples comparison with battery-electric, to further evaluate the capacity at these existing stations and how congestion and access issues will be factored in when determining the capability of the existing infrastructure to meet the demand needs of NZ CNG vehicles.

b. Operational Feasibility

Speed and Frequency of refueling/recharging

The Assessment rates speed and frequency of recharging as 25% achievement for ZE Battery-Electric, compared to 100% for NZ NG ICE. This conclusion assumes a maximum charging rate of 300 kW, for a total recharging time of 1.5 hours. Tesla recommends expanding the scope to include additional truck models, as the current conclusion is not comprehensive. Today's standard charging connectors only support up to 400kW[4] but given that many heavy-duty (HD) trucks will require charging at 500-1,500 kW, new high-power charging connectors will be developed. The Tesla Semi is designed to charge 400 miles of range in 30 minutes, which can be accommodated during a driver's break or between driver shifts.[5] Beyond Tesla, ongoing discussions within the CharIN HD working group are aimed at establishing a new charging standard for HD fast charging.

III. Emissions offset capabilities should be added as a major category

The Assessment uses five parameters to determine overall feasibility for alternative fuel/technology compared to today's baseline diesel drayage trucks and compared to each other. These are: commercial availability, technical viability, operational feasibility, availability of infrastructure and fuel, and economic workability. Emissions benefit or emissions offset capability should be added as a major category when comparing alternative fuel platforms against today's baseline and each other. The Assessment states that its ultimate objective is to ascertain which ZE and/or NZE goods movements platforms are feasible "to fully perform goods movement at the Ports, while also systematically and sufficiently reducing harmful emissions in line with aggressive CAAP goals."[6] The current parameters do not assess the second part of this objective and should be expanded to incorporate emissions benefit.

***

Tesla appreciates the opportunity to provide feedback on the Assessment including the assumptions utilized for the cost comparison analysis. The zero-emission truck market is ripe for innovation with new models of vehicle classes continuously being unveiled. As articulated by CARB in the recent CA Beneficiary Mitigation Plan, "the focus should be on zero emission technologies where available."[7] Therefore, we urge the consideration of our comments above regarding the feasibility of ZE Battery-Electric in the near term and ensuring the targets of the San Pedro Bay Ports' Clean Air Action Plan are met.

Sincerely,

Francesca Wahl
Sr. Policy Associate
fwahl@tesla.com

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[4] While most existing charging equipment offers power levels far below 200 kW, manufacturers are aspiring to use CCS combo and CHAdeMO connectors to provide 350-400 kW. *See* "400 'Ultra-Fast' 350 kW Charging Station Network," Inside EVs, 2017.
[5] Announced Nov 16, 2017. Video can be found online at https://www.tesla.com/semi
[6] Draft Feasibility Assessment p. 10.
[7] CARB, Beneficiary Mitigation Plan, For the Volkswagen Environmental Trust, June 2018.

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January 30, 2019

Heather Tomley, Port of Long Beach
Chris Cannon, Port of Los Angeles

Submitted to: caap@cleanairactionplan.org

Re. Comments on Draft Feasibility Assessment of Clean Truck Technology

Dear Heather and Chris:

We have reviewed the Draft Feasibility Assessment of Clean Truck Technology and appreciate the opportunity to submit the following comments. Our comments are organized under the topics of the Natural Gas Industry, Private Industry Investment, and Summary:

Natural Gas Industry

The Natural Gas Vehicle industry is ready to support the Clean Air Action Plan today. The industry has experienced and overcome the challenges of a new technology. As a member of the Love's Family of Companies, and the expert in alternative fuels infrastructure, Trillium is well positioned to produce multiple Heavy Duty CNG stations in the Ports to support the Clean Air Action Plan.

Private Industry Investment

Private industry investment is needed to meet the goals set in the Clean Air Action Plan. Trillium, a subsidiary of the Love's Family of Companies, operates over 400 heavy duty truck refueling facilities across the US and is well positioned to provide investments in the form of alternative fuel station development, truck financing, and refueling centers – for CNG, Hydrogen Fuel Cell, and Electric vehicles to help the Ports achieve their CAAP goals.

Private investment will be required to meet the Port's clean air goals, and these goals can be met today, with commercially available technology near zero technology. By way of example, and while not referenced in the assessment, hydrogen fuel cell trucks and hydrogen fueling stations in California are 100% grant funded; there's no such thing as private investment with this situation. The $41 million POLA ZANZEFF award for 10 hydrogen fuel cell trucks and two hydrogen stations is a clear example of the extraordinary cost of this zero emission technology. Compare this to the much more cost-effective investment in Near Zero Natural Gas trucks which would require zero public investment, utilize Renewable Natural Gas to support the Port's and States low emission, and reduced carbon goals, and is commercially available for deployment today. Clearly there is no comparison from a cost or health benefits perspective in the near term. Near zero emission engines present commercially available solutions today that can be deployed at scale to achieve progress now and bring us all closer to the Port's CAAP goals.

Looking more closely at the numbers, let's assume a year one deployment of 3,500 new CNG trucks. Today's existing RNG fueling infrastructure can address such a demand. Undoubtedly, there will need to be additional RNG fueling infrastructure required to meet the demands of 18K trucks, which can be deployed by the private sector as demand grows. The CNG industry can build the remaining infrastructure needed to support an additional 3,500 units in year 2 and another 3,500 units in year 3 without question. Essentially, the time required to build each "batch" of stations can take place to support conversion of the fleet in a 3 to 5 year timeframe; which is well aligned with the air quality goals of the Ports.

Summary

Trillium understands that the Ports need private investment to accomplish the Clean Air Action Plan's goals, and that each dollar invested needs to go a long way. Trillium would like to work with the Ports to assess how currently available public monies can be used to replace upwards of 1,000 diesel trucks with NZE technology, and reduce emissions immediately.

Trillium is proud to be a leader in the public and private refueling infrastructure space across the US. As the alternative fuels brand for the Love's Family of Companies, Trillium's goal is to assist our customers with a safe, and cost-effective transition to alternative fuels. Our portfolio of products includes Compressed Renewable Natural Gas, Hydrogen and Electric Vehicles recharging, all of which reduce our customers on-road emissions and carbon footprint in the communities in which they operate.

We look forward to working both Ports and their environmental team to achieve your goals, and are open to discuss Trillium's solutions further in person or conference call at your convenience.

Sincerely,

William "Bill" Zobel
General Manager, Business Development & Marketing
713.332.5726

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January 30, 2019

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Submitted via: caap@cleanairactionplan.org
RE: Draft 2018 Feasibility Assessment for Drayage Trucks

Dear Ms. Tomley and Mr. Cannon,

Thank you for the opportunity to comment on the Draft 2018 Feasibility Assessment for Drayage Trucks ("Assessment"), which provides insight to truck technologies and the specific needs of drayage operations. Such periodic evaluations are critical to ensuring progress towards the widespread adoption of clean vehicles.

We strongly support the Ports' goal of transitioning drayage trucks to zero-emission technologies by 2035. These vehicles provide significant climate and air quality benefits compared to both diesel and natural gas trucks.[1] The urgency in reducing vehicle emissions cannot be overstated given the ongoing effects of air pollution on communities in California and the limited timeframe for reducing climate emissions to a level that avoids severe consequences of global warming.

The good news is that progress on zero-emission heavy-duty vehicles has outpaced what many estimated even just a few years ago. Today, several truck manufacturers are testing Class 8 battery and fuel cell electric vehicles with ranges over 200 miles on a single charge or tank of hydrogen.

While the electric motor has existed in technologies across society as long as the diesel engine – from motors that provide propulsion for air craft carriers to those that spin plates in microwaves, advances in electric trucks are most attributable to the proliferation and reduction in costs of lithium-ion batteries, first in consumer electronics and now in passenger vehicles.

Below we provide specific comments and recommendations to improve the Draft Assessment and the Ports' utilization of it.

[1] Chandler, S., J. Espino, and J. O'Dea. 2017. Delivering opportunity: How electric buses and trucks can create jobs and improve public health in California. Cambridge, MA, and Berkeley, CA: Union of Concerned Scientists and The Greenlining Institute. Online at www.ucsusa.org/sites/default/files/attach/2016/10/UCS-Electric-Buses-Report.pdf.

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1. The Ports should consider their long-term goals in utilizing the Assessment

The Assessment acknowledges its approach of providing "a snapshot in time" and that such a perspective "is not intended to preclude or discourage expanded development, demonstration, and deployment" of electric or natural gas technologies.

With a goal to transition drayage trucks to zero-emission technologies by 2035, the Ports should commit to taking action on areas the report identifies as deficiencies of zero-emission technologies rather than interpreting the report as "it can't be done" or "wait and see" if the technology develops further. The Port should not interpret findings of the Assessment as reason to delay the timeline for transitioning trucks to zero-emission technologies. To ensure the 2035 target is met, the Ports should set annual, interim goals for deploying zero-emission drayage trucks between now and 2035.

2. The Ports must recognize the important role their policies play in driving demand for clean vehicle technologies

Commercial availability – one of the five criteria of the Assessment – is driven by demand, and demand for new vehicle technologies is driven by policy standards. With 11,000 to 18,000 drayage trucks in service, the Ports have significant influence in accelerating the maturation and deployment of technologies. Traditional diesel truck makers have little incentive to change their product offerings absent policies that encourage zero-emission technologies.

3. The Ports should pursue drayage operations ready for electrification today

The Assessment compares the feasibility of electric and natural gas technologies to diesel trucks over a three-year period from 2018 to 2021. The Assessment defines "feasibility" as the ability to provide "similar or better overall performance compared to today's baseline diesel drayage trucks, *when broadly used for all types of drayage service* [emphasis added]."

This framing represents an all-or-nothing criterion that could result in missed opportunities to deploy zero-emission technologies in operations and routes where it is well-suited today. The report identifies three types of drayage service: near-dock (6 to 8 miles one-way); local (8 to 20 miles one way); and regional (20 to 120 miles one way). The feasibility of electric trucks is expectedly different amongst these three types of service.

While drayage trucks do not currently focus on a specific type of service, we agree with the Assessment that it is possible for fleets to target deployments of electric trucks on routes compatible with today's battery technology. Transit agencies have operated similarly, with a given bus traditionally being used for many different routes throughout the week, yet the industry is quickly adopting electric buses by pairing them with appropriate routes and schedules. In the drayage industry, focusing deployments of electric trucks may necessitate mechanisms for coordinating trucks that are not currently in place, especially to aide truck drivers that operate as independent contractors.

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The Assessment estimates that between 1,500 and 2,500 trucks serving the Ports make less than 2.5 moves per weekday. Many operators report average daily mileage of 100 miles or less, one shift per day, and drive loads below the vehicle's maximum weight. These vehicles represent aspects of the drayage industry most suited for the initial deployment of electric trucks.

Finally, with just 3 percent of trucks in the Ports' drayage fleet (roughly 400 trucks),[2] the Assessment categorizes natural gas at Technology Readiness Level 8, "near-final" or "final." Battery electric drayage trucks are already categorized in the Assessment at Technology Readiness Level 6 to 7 and projected to reach Level 8 by 2021. With over $110 million already awarded[3] to support demonstration of over 80 battery and fuel cell drayage trucks, we agree that battery electric drayage trucks can reach Level 8 in the next few years. We also foresee deployments of these vehicles numbering in the hundreds if appropriately supported by state and local policies.

4. **The Assessment should account for investments in charging infrastructure**

In May 2018, the California Public Utilities Commission approved applications from Southern California Edison, Pacific Gas and Electric, and San Diego Gas and Electric to invest $738 million in charging infrastructure for electric vehicles over five years. Edison's approved proposal includes $343 million for investments in charging infrastructure specifically for medium- and heavy-duty electric vehicles. This investment will result in at least 8,490 new electric trucks and buses in Edison's service territory.

The Assessment's financial analysis does not include Edison's investments, but it should, as these investments would pay for expenses related to installation of charging infrastructure, and in some cases, charging equipment over the 2018-2021 timeframe. Installation costs were estimated to be $55,000 of the vehicle's $799,000 total cost of ownership in the Assessment. Charging equipment was estimated at and additional $50,000. Edison can cover 50 percent of equipment costs for trucks deployed by non-Fortune 1000 companies and for trucks operating in disadvantaged communities.

We disagree with the low rating given to battery electric technologies under the metric, "Infrastructure can be constructed at a pace consistent with fleet adoption and is able to meet fleet fueling/charging requirements by the end of the assessment period." There are just 393 new drayage trucks (model years 2018 and 2019) registered to serve the Ports out of 17,600 registered trucks. Even if all of these new vehicles were battery electric, it is entirely within the realm of Edison's approved infrastructure investments to support this number of vehicles.

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[2] Port of Long Beach. 2018. POLB Truck Moves Data Analysis. Online at www.polb.com/civica/filebank/blobdload.asp?BlobID=6591.

[3] Personal communication with staff at the California Air Resources Board, January 28, 2019.

5. The Assessment should include the significant financial incentives currently available

The report states, "to be conservative, it is recommended that economic workability be based on non-incentivized cost of ownership and recommends discounting the value of incentives." It also states, "Reliance on incentives to determine economic workability is problematic. These incentives are not guaranteed over the 12-year operational life of a truck."

The Assessment is critically flawed in making the above statements for three reasons. First, the Assessment is specifically focused on the 2018-2021 timeframe. Policies are already in place guaranteeing the availability of financial incentives for electric trucks during this time period, namely HVIP incentives and Volkswagen settlement funding that offset the purchase cost of a vehicle; Low Carbon Fuel Standard (LCFS) credits that offset fuel costs; and Senate Bill 350 investments that offset charging infrastructure costs.

Second, both purchase incentives and infrastructure investments provide upfront cost-savings that, by definition, are guaranteed over the life of a vehicle. Third, while LCFS credits accrue over the life of a vehicle, the standard was recently strengthened to a 20 percent reduction in fuels' carbon intensity by 2030, after which the standard will remain at this level, thus providing a high degree of certainty that financial benefits from the LCFS will exist over the 12-year operational life of a truck.

An important conclusion from the Assessment, however, is that existing incentives make battery electric drayage trucks the lowest cost technology today. This result is consistent with analysis performed by the California Air Resources Board that found with just LCFS credits, battery electric drayage trucks are cheaper than diesel trucks for the vehicle's total cost of ownership.[4]

6. Vehicle emissions should be considered in the evaluation of a technology's feasibility

Heavy-duty battery electric vehicles have zero tailpipe emissions and 75 percent lower life cycle global warming emissions than diesel and natural gas vehicles on today's grid in California.[5] The Assessment's analysis of cost effectiveness, weighted by emission reductions, does not appear to reflect similar levels of emission benefits from battery electric drayage trucks.

One source of error in the Assessment's emissions analysis could be the fuel efficiency used for diesel, natural gas, and battery electric trucks. The Assessment assumes battery electric

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[4] California Air Resources Board. 2017. Advanced Clean Local Trucks Second Workgroup Meeting. Online at https://ww2.arb.ca.gov/sites/default/files/2018-10/170830arbpresentation.pdf.

[5] O'Dea, J. 201 Electric vs. Diesel vs. Natural Gas: Which Bus is Best for the Climate? *The Equation*. Cambridge, MA: Union of Concerned Scientists. Blog, July 19. Online at https://blog.ucsusa.org/jimmy-odea/electric-vs-diesel-vs-natural-gas-which-bus-is-best-for-the-climate.

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vehicles are just 2.5 times more efficient than diesel, which is inconsistent with several side-by-side vehicle comparisons such as those embodied in the California Air Resources Board's energy efficiency ratio, which concludes battery electric trucks are 5 times more efficient than diesel.[6] Furthermore, the National Renewable Energy Laboratory's evaluation of transit buses operated by Foothill Transit has shown battery electric buses have 4 to 8 times better fuel efficiency than natural gas buses operated over similar routes.[7]

The source of the Assessment's inaccurate fuel efficiencies appear to be a reliance on fleet survey data and manufacturer data rather than side-by-side comparisons of diesel, natural gas, and battery technologies. While there is limited data comparing drayage trucks across these technology types, several comparisons exist in other truck applications that should be incorporated into the Assessment's analysis.

Considering the Ports' 2035 goal of all zero-emission drayage trucks serving the Ports, the Assessment should consider the possibility of stranded assets in the financial analysis of natural gas trucks. Investments made in natural gas fueling infrastructure will become obsolete as trucks transition to electric technlogies. Due to the high global warming emissions from natural gas trucks, the Assessment should also consider that this fuel will become a financial liability as a deficit generator rather than a credit generator under the LCFS beginning in 2024.[8] In all, the significant reduction in emissions offered by battery electric trucks make them exceptionally more feasible in the context of achieving local, state, and global reductions in criteria and climate emissions.

Thank you for your consideration of our comments and recommendations.

Sincerely,

Jimmy O'Dea

James R. O'Dea, Ph.D.
Senior Vehicles Analyst
Union of Concerned Scientists
Oakland, California

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[6] California Air Resources Board. 2019. Low Carbon Fuel Standard Regulation. Online at www.arb.ca.gov/fuels/lcfs/fro_oal_approved_clean_unofficial_010919.pdf.

[7] Eudy, L. and M. Jeffers. 2017. Foothill Transit Battery Electric Bus Demonstration Results: Second Report. NREL/TP -5400-67698. Golden, CO: National Renewable Energy Laboratory. Online at www.nrel.gov/docs/fy17osti/67698.pdf.

[8] California Air Resources Board. 2018. Proposed Amendments to the Low Carbon Fuel Standard Regulation and to the Regulation on Commercialization of Alternative Diesel Fuels. Online at https://www.arb.ca.gov/regact/2018/lcfs18/15daynotice.pdf.

US Hybrid is pleased to provide following response to San Pedro Bay Ports, Clean Air Action Plan.

We thank the Port authorities and commissioner for their leaderhsip in clean and efficient transporation in support of port communites. I live in Rolling Hills and work in Torrance, therfore my family and employees are direct beneficiaries of the clean port and local job creation in port communties.

The 2018 Feasibility Assessment for Drayage Trucks is for commercial viability, since the technology and products are proven. Hence the focus is not only in response to port community environmental justice, but also on ROI for the operators and port tenants, so the cost is not passed on to customers to the point that it will diversely impact ports business competitiveness.

1. The total annual new Dryage trucks purchases are 500 trucks (average over last 4 years), presenting a niche market rather than main stream.
2. We recommend changing the definition of NZE-PHEV to Hybrid Zero Emission "HZE", which includes all forms of hybrid vehicles that offer zero-emission operation at the port vicinity (to be determined). HZE may offer best environmental benefit ROI for midterm technology and product for heavy duty Class 8 (80,000 lb. GVWR) transition. Also, offering zero-emission at port and near zero-emission at the regional operation with better fuel economy and performance than diesel at much lower operating cost, as well as offering less than 2 years ROI compared to other ZE truck powertrain technologies. US Hybrid provided two HZE trucks to TTSI for one-year demonstration and the two trucks had more combined mileage than the battery and fuel cell trucks combined with comparable or better fuel economy and performances than Diesel trucks, as such stands at higher TRL level than ZE as stated in Table 13. HZE emission ensures that NZ engines meet the NOx level at port cyclic duty, which includes substantial transients and engine shut downs (idle control).
3. In reference to truck powertrain horsepower rating as referenced in Figure 9, US Hybrid urges a minimum of 400 hp of tractive power (not battery power) to ensure these trucks meet the minimum handling performance. Please note at 400 hp, the max speed at 6%

grade is 25mph. Lack of power was the main reason that the 2010 CNG fleet was grounded and taken off the road. IXL12N power at best is 400hp, for reference.

4. CORRECTION, Table 16 has an error at which the entry of Gradability @40 mph applies to 57,000 lbs, 6% and Gradability @35 mph applies to 80,000 lbs. which puts the minimum power rating to 559 hp, DISQUALIFYING the IXL12N near-zero engine for the market operation.
5. Performance shown in Table 17 with green check marks, is not true and there is no ZE truck deployed/demonstrated that can maintain 40 mph at 6% grade at 80,000 GVWR. Need correction. There are promises made, but to my knowledge no such truck has been demonstrated. The most powerful truck deployed with TTSI, made by US Hybrid can delivery 326 kW (437 hp at the drive shaft) and the best we can do is 29 mph at 6% grade. We strongly believe that TRL level for Dryage truck at 80,000 GVWER is at best at Level 6, not Level 7 as shown in Table 13. If we require at least 150 miles range, then that will put more demand on the tractor weight. Currently BYD truck curb weight is 25,000 lb., as well as the Toyota FC trucks, at which both violates Caltrans tire patch loading, if not axle loading. FC trucks such as US Hybrid ZECT-II truck at curb weight of only 16,000 lbs and 200 miles ranges provides much higher payload capacity for the operator compared to Battery trucks.
6. Economic assessment for ZE, battery trucks are underestimated. Having been in EV industry for over 36 years, the operation cost of battery electric (at SCE rates with no peak demand charge) is higher than CNG trucks. US Hybrid facility in Torrance net electric bill (excluding charge demand) is about $0.28/kWh, as total bill by SCE. The pump charge for NG and Diesel at the pump includes all taxes and overhead at the point of delivery. We need to be upfront with operators to expect a rate of $0.48/mile just for electric usage plus whatever the peak demand charge (and no battery replacement cost) is, compared to $0.36/mile of NG, which contradicts with Table 35. Some reference to actual electric bills should be included. Assuming that a battery can do 6,000 charge cycles at 100 Wh/kg (net) and cost of $500/kWh (for high power and energy density battery as current rate), the amortize battery life cost is $0.083 per mile, which is about 18% of the energy cost, so the effective net fuel cost for battery electric is $0.56/mile. We do agree that the electric powertrain has lower maintenance cost than combustion. Not only for the powertrain, but also for the brakes, scheduled maintenance, lubrications, and

wear and tear due to engine thermal cycling and electric smooth operation with superior NVH.

7. We need to also include FC truck cost effectiveness on Section 9 of the report, as the BEV has its limitation of productivity due to range and charge time and heavier curb weight. We require about 2GGE equivalent of NG to make one kg of H2 that can provide a performance equivalent of >2 Gallons of diesel or triple efficiency of NG engines. Off course presently the H2 cos is high ($14.9 /kg) mainly due to scale of economy related to low utilization, otherwise the energy cost should be lower since it is 3X more efficient and has zero-emission.

In summary, any or all initiatives of utilizing ZE, battery, ZE Fuel Cell, HZE and NZE technologies are good, however we need to be more realistic in educating the regulators, and most importantly the operators, to ensure large scale adaptation of these technologies in leu of Diesel to support port communities.

As a local industry and port resident, we support and salute your leadership for making the ports a better place to work and a good member of local communities and commerce.