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Clerk of the Board
California Air Resources Board
1001 I Street, Sacramento, CA 95814

Submitted electronically via email to: Comments to the Board (ca.gov)

Re: Proposed regulation: Advanced Clean Fleets (ACF)

Dear Chair Randolph and Members of the Board,

Phillips 66 Company (Phillips 66) appreciates the opportunity to comment on the Air Resources Board (ARB) proposed regulation for Advanced Clean Fleets (ACF). Phillips 66 is a major refiner and marketer of transportation fuels and other products in California where we market primarily through the 76® brand. Phillips 66 is currently producing low carbon intensity (CI) renewable diesel (RD) fuel at our Rodeo, California facility and is planning a full conversion of that facility by 2024 to be one of the largest producers of RD in the world. In addition, Sentinel Transportation, LLC - a fully owned subsidiary of Phillips 66 – operates a fleet of trucks transporting crude oil, refined petroleum products and renewable fuels in the state. This regulation will therefore impact Phillips 66 and its subsidiary as both a fleet owner and a fuel supplier in California.

We support and incorporate herein by reference the comments submitted by the American Petroleum Institute and Western States Petroleum Association (WSPA), dated October 17, 2022, and provide the following comments to emphasize key points.

1. **ACF should embrace commercially available renewable fuels such as RD for fleet decarbonization**

Phillips 66 recognizes that the transition to lower-carbon transportation is underway in California and ACF is intending to advance medium- and heavy-duty vehicles (MHDVs) towards a lower-carbon future. However, ACF's approach of achieving MHDV decarbonization goals is restrictive as it mandates zero emission vehicles (ZEVs) for the regulated fleets, and it narrowly defines ZEVs as battery electric vehicles (BEV) and hydrogen fuel cell electric vehicles (FCEV) while completely ignoring the greenhouse gas (GHG) reductions from commercially available renewable fuels that fleets are using now. These renewable fuels such as RD, biodiesel, and renewable natural gas have lower CI than their petroleum counterparts, are available at scale, and can be moved via the existing infrastructure utilized by petroleum fuels. The ACF technology mandate will result in picking winners and losers, and it shows disregard for consumer choice and availability of other lower emission fuels such as RD that can facilitate faster GHG reductions. Phillips 66 would like to highlight the following key points about RD:

A. **ARB's current regulations support RD** – ACF hasn't included RD-fueled vehicles as lower emission vehicles, which is sending mixed signals to stakeholders including companies that may want to or have already invested in RD production. These signals are also inconsistent with ARB's Scoping Plan and other adopted regulations where there is a robust support for RD, as described below -

i. Scoping Plan – The draft Scoping Plan suggests 2 million MHDV stock by 2035 increasing to 2.3 million by 2045. About 46% of this fleet is assumed to still have internal combustion engines by 2035 and with declining role for petroleum diesel, RD will be playing a key role as the fuel of choice for roughly one million MHDVs through year 2045. As per the 2022 draft Scoping Plan and 2022 LCFS data, about 85,000 barrels per day (BPD) of RD supply (about 36% of the total in-state diesel demand) is currently available and is projected to increase to 140,000 BPD by 2030.

ii. Low Carbon Fuel Standard (LCFS) regulation – The LCFS regulation, with its existing CI standard, supports production and use of low CI fuels like RD for MHDVs.

iii. In use, Off-road regulation - ARB's proposed amendments to the In-use, Off-road Diesel-Fueled Fleets regulation (Off-road regulation) require that existing off-road fleet to use R99 or R100 RD beginning January 2024.

B. RD has a superior GHG emission profile on a lifecycle basis – According to a study conducted by the American Trucking Research Institute for Class VIII trucks[1], on a cradle-to-grave lifecycle analysis basis, RD exhibits a superior emission profile compared to petroleum diesel with up to 70% reduction in GHGs as shown in Table 1. The same study reported that a BEV using electricity from a grid with about 40% renewable energy will have a higher lifecycle carbon emission after considering emissions associated with vehicle production, energy production and consumption, and vehicle disposal. In 2022, CA electricity grid carbon intensity is ~0.60 lbs of CO_2/kWh[2]. Until CA exceeds the statutory goals set by SB 100 of at least 60% renewable retail electricity on a continuous and reliable basis by 2030, RD fueled Class VIII trucks will continue to provide superior GHG benefits. Other studies[3,4] have also reached similar conclusions for light-, medium-, and heavy-duty vehicles.

Table 1. Cradle-to-grave* lifecycle CO_2 emissions for a Class VIII diesel truck driven a million miles (based on data from reference 1)

Vehicle type	CO_2 emissions/mile (lbs/mile)
Diesel internal combustion engine	3.6
BEV**	2.6
FCEV***	2.0
Renewable diesel internal combustion engine****	1.1

*: Includes CO_2 emissions from vehicle production, energy production and consumption, and vehicle disposal and recycling.
**: Based on US average grid electricity carbon intensity of 0.91 lbs of CO_2/kWh.
***: Hydrogen production from natural gas steam methane reforming.
****: Renewable diesel produced from soybean-based feedstock.

[1] ATRI Understanding the CO_2 Impacts of Zero-Emission Trucks. 2022. Available here: https://truckingresearch.org/wp-content/uploads/2022/05/ATRI-Environmental-Impacts-of-Zero-Emission-Trucks-Exec-Summary-5-2022.pdf. Accessed on October 13, 2022.
[2] LCFS Annual Updates to Lookup Table Pathways (ca.gov), Accessed on October 14, 2022.
[3] Argonne GREET Publication: Cradle-to-grave lifecycle analysis of U.S. light-duty vehicle-fuel pathways: a greenhouse gas emissions and economic assessment of current (2020) and future (2030-2035) technologies (anl.gov), Accessed on October 13, 2022.
[4] Life Cycle Analysis Comparison: Electric and Internal Combustion Engine Vehicles | Fuels Institute, Accessed on October 13, 2022.

C. RD is commercially available and being utilized by CA fleets - As mentioned earlier, RD is currently being produced at scale in CA in standalone units and distributed to customers. Phillips 66 has already started production of 9,000 BPD of RD at the Rodeo (San Francisco) facility with sanctioned plans to increase the production to 50,000 BPD by 2024. This project and projects announced by other companies could produce ~ 140,000 BPD RD for use in California by 2030 (based on the 2022 draft Scoping Plan data), which represents more than 50% of total in-state diesel demand.

Sentinel Transportation LLC, a fully owned subsidiary of Phillips 66, is currently using RD in 95% its Southern California fleet and seeing benefits associated with GHG emissions and fuel economy. In addition, maintenance of RD-fueled vehicles is similar to vehicles using petroleum diesel. Many other fleets in CA are also using RD and seeing similar benefits as is evident from comment letters submitted to ARB in response to the proposed ACF regulation[5].

D. RD is using existing infrastructure - RD is currently utilizing existing petroleum infrastructure including pipelines and terminals, retail sites, and providing a cost-effective fuel option to existing fleets. The produced RD is already being distributed to CA consumers via retail stations, truck stops, and cardlocks (a fleet fuel management method that includes access to 24-hour automated fueling using fleet cards). RD does not require construction and build-up of new infrastructure as in the case of BEVs with charging infrastructure. ARB staff has failed to capture this key point in calculating total cost of ownership of a vehicle regulated by the ACF.

Contrary to the support provided to RD in the above-mentioned regulations and its wide commercial availability and use, the proposed ACF regulation requires new on-road vehicle purchases to be either BEV or FCEV without giving any credit or flexibility to vehicles that will be potentially using RD. Phillips 66 is concerned that by sending conflicting signals for RD use in on-road and off-road vehicles, ARB is missing on utilizing an abundantly available and low emission fuel. An all-ZEV mandate for MHDV applications fails to take full advantage of near-term and long-term RD supply that CA fleets are currently utilizing and could result in stranded RD capital investments by CA businesses.

Recommendation: Utilize the existing large-scale availability of RD in the State and ensure a continuing role for RD in the ACF regulation by providing a crediting mechanism that is consistent with LCFS and Off-road regulations.

2. ARB should continue to support in-state production of hydrogen and development of associated distribution infrastructure

Phillips 66 believes that hydrogen can play a key role in decarbonization of MHDVs and is currently pursuing opportunities to make low CI hydrogen available at scale. Phillips 66 and H2 Energy Europe are developing a hydrogen refueling network in Germany, Austria and Denmark[6]. Phillips 66 and Plug Power have signed a memorandum of understanding to collaborate on the development of low-carbon hydrogen business opportunities[7].

Phillips 66 commends ARB staff for including hydrogen as one of the fuels for CA fleets in the proposed ACF regulation. As FCEV adoption increases, it is important to ensure that the development of infrastructure associated with production, transportation, and distribution of hydrogen is scaling up at an equivalent pace. According to ARB's recently released *2022 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and*

[5] ACF Comment 146, Microsoft Outlook - Memo Style (ca.gov), Accessed on October 14, 2022.
[6] Phillips 66 and H2 Energy Europe close on joint venture to create European network of hydrogen refueling stations - Phillips 66 - PSX, Accessed on October 13, 2022.
[7] Phillips 66, Plug Power Sign Agreement to Advance Green Hydrogen - Phillips 66 - PSX, Accessed on October 13, 2022.

Hydrogen Fuel Station Network Development report[8], steady progress has been made to meet the AB 8 goal of building 100 stations with about 60 stations currently in operation across the state. However, the majority of the dispensed hydrogen at these stations is sourced from out-of-state sources[9]. To achieve the 100-station objective of AB 8 with in-state produced hydrogen, Phillips 66 provides the following recommendations:

A. **Broaden the scope of feedstocks used to produce low CI hydrogen in the LCFS Hydrogen Refueling Infrastructure (HRI) crediting program:** Existing industrial plants in CA have ability to provide low CI hydrogen for the FCEV fleet. This can be achieved by utilizing renewable feedstocks such as renewable natural gas and/or use of carbon capture and sequestration for hydrogen production units. As mentioned earlier, many California refineries are transitioning to produce RD and a by-product of that process, renewable propane, can also be used as a renewable feedstock for hydrogen. Use of these renewable feedstocks need to be specifically allowed under the LCFS HRI crediting program.

B. **Support development of in-state hydrogen supply chain**: At present, the focus of AB 8 is on building downstream infrastructure such as hydrogen refueling stations across CA, but a focus also needs to be on development of in-state hydrogen supply chain to provide hydrogen to those refueling stations. This includes upstream infrastructure development such as hydrogen-dispensing truck racks and hydrogen transportation pipelines. Phillips 66 urges ARB to collaborate with other CA agencies to streamline the permitting process for expedited development of hydrogen infrastructure.

Phillips 66 stands ready to collaborate with ARB to make large-scale hydrogen production and distribution for transportation uses a reality in CA.

Recommendation: Broaden the scope of feedstocks used to produce low CI hydrogen in the LCFS HRI crediting program and support infrastructure development for a well-functioning in-state hydrogen supply chain.

3. ARB should carefully consider competitive disadvantage created by ACF for regulated fleets

CA-registered trucks compete with out-of-state trucks for long-haul transport. As a fleet owner in CA, Phillips 66 and its subsidiary Sentinel Transportation, LLC are concerned about the competitive disadvantage that the ACF regulation can impose on large CA fleet owners due to payload and long-haul transport challenges posed by BEVs.

A. **BEVs can result in payload cost disadvantages**: According to an independent research study conducted by the American Trucking Research Institute[10], the weight of the on-board battery may substantially limit the long-haul capabilities of a BEV. Their research indicates that for an 80,000 lb gross weight vehicle (the maximum allowed per California Vehicle Code), using a BEV will result in 27% lower payload capacity vs. a conventional truck while the payload difference is ~6% for a FCEV. If a BEV is used instead of an internal combustion engine truck, this 27% decrease in payload capacity for obligated fleets will force them to either purchase more BEVs or increase number of trips to carry the same amount of cargo – both options resulting in increased payload transport costs. This in turn can make fleet owners like Sentinel Transportation, LLC cost-disadvantaged as the non-obligated fleets

[8] Annual Hydrogen Evaluation | California Air Resources Board, Accessed on October 13, 2022.
[9] Celebrating Two Months of Air Liquide's North Las Vegas Liquid Hydrogen Production Plant! | Air Liquide USA, Accessed on October 13, 2022.
[10] ATRI Understanding the CO_2 Impacts of Zero-Emission Trucks. 2022. Available here: https://truckingresearch.org/wp-content/uploads/2022/05/ATRI-Environmental-Impacts-of-Zero-Emission-Trucks-Exec-Summary-5-2022.pdf. Accessed on October 13, 2022.

will be able to carry the same payload at a lower cost using existing trucks. A larger number of vehicles on road will also increase vehicle miles traveled (VMT) and traffic congestion.

B. BEVs can result in payload transport (long- and short-haul) disadvantages: BEVs have inherent operating issues for a fleet that runs 24/7. As the current BEV range is not adequate to drive the equivalent distance that a conventional truck will drive within a shift, BEVs will need to utilize in-route charging. The extra time required to charge a BEV would result in less distance travelled per shift and would require scheduling more shifts per truck to deliver the payload, theoretically causing fleet owners to increase fleet size resulting in corresponding increase in VMTs. As of today, a BEV is not approved to operate at a refined petroleum loading rack (our core business in CA) unless intrinsically safe.

In addition to disadvantages induced by the weight of battery packs, cold weather can impact battery performance resulting in longer charging times and/or reduction in the driving range impacting cost-effective delivery of the payload. Ambient temperature changes can necessitate the use of onboard heating or cooling that can draw significant amounts of battery power further accelerating the reduction in driving range. As per a study conducted by the Fuels Institute, for some vehicles, this impact of cold weather could result in as much as 40% drop in battery efficiency.[11]

To summarize, lower payload capacity, frequent charging during a truck shift, and length of charging will likely result in the need to add more trucks to the fleet to make up for the lost capacity and to move the same number of payloads resulting in increased costs and VMTs. These issues are in addition to the approximate 200-300% cost premium[10] that fleet owners will have to pay upfront to purchase a ZEV. A compounding effect of these issues is increase in the total cost of ownership for fleet owners resulting in competitive disadvantage. Phillips 66 and Sentinel Transportation, LLC are deeply concerned about these disadvantages.

Recommendation: Address disadvantages of BEVs associated with payload transport by providing flexibility in the ACF regulation (such as use of RD) so that CA fleets can remain competitive.

Concluding remarks

In summary, the ACF regulation in its current form is attempting to reduce GHG emissions from MHDV with aspirational requirements while disregarding practical and currently available fuel options. Phillips 66 urges ARB to reconsider the currently drafted ACF regulation and recommends updating it to utilize large scale availability of RD, include robust plans for development of hydrogen refueling infrastructure, and provide flexibility for CA fleet owners and operators to remain competitive.

Thank you for this opportunity to submit comments. If there are any questions, please contact me at (832) 765-1274 or Sourabh.s.pansare@p66.com or Steven Smith at 832-765-1779 or steven.d.smith@p66.com.

Sincerely,

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[11] Life Cycle Analysis Comparison: Electric and Internal Combustion Engine Vehicles | Fuels Institute, Accessed on October 13, 2022.