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Submitted electronically

Liane Randolph, Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95814
VIA E-mail: cleancars@arb.ca.gov

Re: Comments on the Proposed Advanced Clean Cars II Regulations

Dear Chair Randolph:

Pursuant to the California Air Resources Board's (CARB's) Proposed Advanced Clean Cars II Regulations: All New Passenger Vehicles Sold in California to be Zero Emissions by 2035 (ACC II),[1] Tesla respectfully submits the following comments. Tesla incorporates by reference its written comments in response to previous ACC II workshops and presentations.

Tesla continues to support CARB and the state of California in defending the state's authority under §209 of the Clean Air Act and the state's vehicle greenhouse gas (GHG) emissions standards.[2] Tesla shares and appreciated the goals, direction, and leadership CARB has exhibited in its ACC II process and proposal. Indeed, Tesla is grateful to CARB staff for the ongoing engagement and technical conversations staff throughout the process. Per the comments below, Tesla seeks to ensure CARB adopts final rules and regulations that achieve the maximum technologically feasible and cost-effective greenhouse gas and criteria air pollutant emissions reductions that protect the health and welfare of all the state's residents and its environment.

I. Introduction

Tesla's mission is to accelerate the world's transition to sustainable energy. Moreover, Tesla believes the world will not be able to solve the climate change crisis without directly reducing air pollutant emissions—including carbon dioxide (CO2) and other GHGs—from the transportation and power sectors.

To accomplish its mission, Tesla designs, develops, manufactures, and sells high-performance fully electric vehicles and energy generation and storage systems, installs, and maintains such systems, and sells solar electricity. Tesla currently produces and sells four fully electric, zero emissions vehicles (ZEVs): The Model S sedan, the Model X sport utility vehicle (SUV), the Model 3 sedan, and the Model Y mid-sized SUV. The Environmental Protection Agency (EPA), recognized Tesla in its *2021 Automotive Trends Report* as having the

[1] California Air Resources Board, Proposed Advanced Clean Cars II Regulations (Apr. 12, 2022).
[2] See e.g., *Union of Concerned Scientists v. NHTSA*, Docket No. 19-1230 (Consolidated with 19-1239, 19-1241, 19-1242, 19-1243, 19-1245, 19-1246, 19-1249) (D.C. Circuit filed Nov. 15, 2019) (challenging EPA's CAA waiver withdrawal and protectively challenging NHTSA's EPCA preemption rule); *California, et al.v. EPA,* Docket No. 18-1114 (consolidated) (D.C. Circuit, Oct. 25, 2019); Tesla, Comments to EPA on Reinstating California Waiver (July 6, 2021); Tesla, Comments on NHTSA Preemption Regulations (June 11, 2021).

lowest carbon dioxide emissions (0 g/mi) and highest fuel economy (119 miles per gallon equivalent) of all large vehicle manufacturers in MY 2020.[3] Tesla is by far the largest producer of zero emission vehicles (ZEVs) for sale in California.[4]

Tesla is also deeply committed to ensuring the United States (U.S.) remains a leader in advanced manufacturing. All Tesla vehicles sold in North America are manufactured in the U.S. In 2021, the Tesla Model 3 ranked as the most American made car, based on overall contributions to the U.S. economy, and the Model Y ranked just below as the third most American made car on the market.[5] NHTSA similarly confirms that 100% of the vehicle, engine, and transmission assembly in each Tesla vehicle sold in the U.S. occurs in the U.S.[6] In addition, Tesla's U.S. supply chain continues to expand and spans across more than 40 states.[7]

Tesla's current footprint in the State of California is significant and CARB should recognize the benefits a stringent ACC II rule will have on the state's economy.[8] Tesla now employs over 45,750 people in California making it the largest manufacturing employer in the state. This employment spans across 115 locations, including the factory, sales, services, and delivery locations. Tesla conducts vehicle manufacturing and assembly operations at its factory in Fremont, CA, manufacturers its new 4680 lithium-ion battery cells at another facility in Fremont, produces Tesla Megapack energy storage products at its facility in Lathrop, CA, and supports numerous functions across the company from its offices in Palo Alto. As of April 2022, Tesla has made a cumulative investment of $10.5 billion in the state[9], including $1.5 billion in wages for 20,000 manufacturing jobs, and $2.66 billion spent across 431 active California suppliers over the last twelve months.

In the U.S., Tesla also produces electric drive trains and manufactures advanced battery packs and energy storage products, at its Gigafactory Nevada in Sparks, NV. Tesla builds and services highly automated, high-volume manufacturing machinery at its facility in Brooklyn Park, MN, and operates a tool and die facility in Grand Rapids, MI.[10] Tesla produces solar energy and vehicle charging products at its Gigafactory New York in Buffalo, NY. In the spring of 2022, Tesla began production of Model Y vehicles at its newest vehicle and advanced battery manufacturing facility in Austin, TX.[11] Globally, by 2030, Tesla aims to sell 20 million electric vehicles per year.[12]

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[3] EPA, The 2021 EPA Automotive Trends Report, Greenhouse Gas Emissions, Fuel Economy, and Technology Since 1975 at 13 (Nov. 2021) (preliminary MY 2021 at 125.7 miles per gallon); See also, Tesla, Impact Report 2021 at 55-63 (discussing Tesla vehicle emission performance).
[4] See, California Energy Commission (CEC), New ZEV Sales in California; See also, CEC, Light-Duty Vehicle Population in California
[5] Cars.com, Tesla Model 3 Snags No. 1 Spot on Cars.com's 2021 American-Made Index®; First All-Electric Vehicle to Top the List in Its 16-Year History (June 23, 2021); See also, American University, Kogod School of Business, 2021 Made in America Index (Oct. 15, 2021) (Finding in 2021, each of Tesla's vehicles - the Model S, 3, X and Y - ranked in the top 10 and Tesla was the only manufacturers to have representation from its entire portfolio in the top 10.).
[6] NHTSA, Technical Support Document: Proposed Rulemaking for Model Years 2024-2026 Light Duty Vehicle Corporate Average Fuel Economy Standards (Aug. 2021) at 96, Table 2-6.
[7] See e.g., AutoNews, Suppliers Starting to Set Stage for Tesla in Texas (Sept. 5, 2021).
[8] See, Cal. Govt. Code Art. 5, § 11346.3
[9] Also includes Fremont: Over $4.9 billion to modernize the factory, creating a hub of advanced manufacturing in the region; Palo Alto: Over $193 million to modernize the Deer Creek and Hanover facilities; and Lathrop: $38 million in construction projects.
[10] See Tesla, Manufacturing: Build a Sustainable Future.
[11] The project will invest over $10B in factory development and create 20,000 new jobs. Upon full completion, the Gigafactory Texas will produce Tesla's new Cybertruck and Model Y crossover, and manufacture Tesla's new, advanced 4680 lithium-ion battery cell and battery packs.
[12] Tesla, Impact Report 2020 (Aug. 10, 2021) at 2.

Tesla also continues to make significant investments in advancing EV, solar, and battery storage technology with over $1.1 billion dedicated to research and development (R&D) in 2021 alone.[13] A recent analysis found that Tesla's R&D investment triples that per vehicle compared to other manufacturers.[14] Tesla is one the country's leading residential solar installers.[15] In 2021, Tesla solar deployments increased 68% year-over-year (YoY) and totaled 345 MW.[16]

Currently, Tesla has more than 65,000 employees in the U.S. and has infused billions of dollars in economic activity and created thousands of direct and indirect jobs in states like California,[17] Nevada,[18] Texas, Utah, and New York.[19] Tesla is a leader in creating a diverse and inclusive workplace and is a majority-minority company with a large representation of employees from communities that have long struggled to break through the historic roadblocks to equal opportunity in the U.S.[20] As of December 31, 2020, 34% of our directors and vice presidents are people of color.[21] Tesla also provides highly competitive wages that meet or exceed that of comparable manufacturing roles, even before equity and benefits are factored in.[22]

The company is also investing in its growing network of retail stores, vehicle service centers, and electric vehicle charging stations to accelerate and support the widespread adoption of its EV products. Since 2012, Tesla has invested heavily in siting, building, and operating EV charging infrastructure. In 2013, Tesla had just eight Supercharger Stations in North America. As of April 2022, this global network has grown to include over 3,700 Supercharger Stations with almost 34,000 individual connectors.[23] In 2021, Tesla opened 912 new Supercharger locations around the world – an average of two and half new locations every day.[24] Tesla's charging network also includes over 14,000 Destination Charging locations and over 28,000 Destination Charging connectors worldwide that replicate the convenience of home charging by providing hotels, resorts, and restaurants with Tesla Wall Connectors.[25] Tesla is committed to continue expanding these networks to provide a convenient and seamless charging experience for our customers.

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[13] See Tesla, SEC Form 10-K (Jan. 26, 2022) at 39; See also, InsideEVs, Tesla Spends Least On Ads, Most On R&D: Report (Mar. 25, 2022)(reporting that Tesla spends $2,984 per car on R&D and that such spending is three times the industry average and higher than Chrysler, Ford, and GM's R&D budgets combined); See also,
[14] See Visual Capitalist, Comparing Tesla's Spending on R&D and Marketing Per Car to Other Automakers (Oct. 11, 2021) (Tesla is spending an average of $2,984 per car sold on research and development (R&D)—often triple the amount of other traditional automakers.)
[15] See Wood Mackenzie, Sunrun retains its title as the largest residential solar installer in the US (March 31, 2021)
[16] Tesla, Q4 and FY 2021 Update (Jan. 26, 2022) at 11.
[17] See, e.g., IHS Markit, The Economic Contribution of Tesla in California (May 2018) (Tesla infusing over $4 billion into the California economy in 2017 alone).
[18] See, e.g. Nevada Governors Economic Office of Economic Development, Tesla Compliance Audit and Transferable Tax Credit Certificate (July 1, 2018 - June 30, 2019) (Sept. 15, 2021) at Appendix A (showing almost $5B in total capital investment from Oct 2014 – June 2019).
[19] See, e.g. WIVB, Tesla officially exceeds Buffalo hiring requirement (Feb. 1, 2022)(reporting more than 2,200 jobs in New York State and cumulative investment and spend in New York State of over $1B between Jan 1, 2015 and Dec. 31,2021); See generally, DOE, FASB, National Blueprint For Lithium Batteries 2021–2030 (June 7, 2021) at 10 ("With the increasing electrification of the U.S. transportation sector, growth in employment associated with EVs has already been demonstrated, with electric hybrids, plug-in hybrids, and all EVs supporting 198,000 U.S. employees in 2016, and 242,700 U.S. employees by 2019.").
[20] Tesla, Impact Report 2021 at 36-38 (providing extensive workforce statistics); See also, Tesla, Impact Report 2020 at 71-72 (describing Tesla's workforce), See also, Tesla, Diversity, Equity and Inclusion Impact Report 2020 (U.S.) (Dec. 4, 2020).
[21] Tesla, Impact Report 2021 at 35-41 (providing details and statistics describing Tesla's workforce), submitted as an attachment to these comments; See also, Tesla, Diversity, Equity and Inclusion Impact Report 2020 (U.S.) (Dec. 4, 2020).
[22] Tesla, Impact Report 2021 at 28-31 (describing Tesla's wages. benefits, and compensation).
[23] See Tesla, Supercharger; See also, Tesla, Q1 2022 Update (Apr. 22, 2022) at 6..
[24] See InsideEVs, Tesla: In 2021 Supercharging Uptime Improved To 99.96% (May 10, 2022).
[25] See Tesla, Destination Charging.

More specifically, Tesla has made vast investments in California's electric vehicle charging infrastructure. While ever expanding, in California, Tesla currently operates 298 Supercharger (DC Fast Charging) sites with 4630 stalls and almost 2500 Level-2 destination chargers. In 2021, Tesla's global Supercharger network was 100% renewable, achieved through a combination of onsite resources and annual renewable matching. Additionally, all home charging in California was 100% renewable through annual renewable matching.

II. General Perspectives on the Vehicle Electrification and the CARB Proposal

Tesla supports CARB's efforts to accelerate light-duty vehicle electrification as it is essential for reducing GHG and criteria pollutants and addressing the rapidly escalating climate crisis. Recently, Governor Newsome acknowledged that California faces a climate crisis stating:

California is doubling down on our nation-leading policies to confront the climate crisis head-on while protecting the hardest-hit communities. We're deploying a comprehensive approach to meet the sobering challenges of the extreme weather patterns that imperil our way of life and the Golden State as we know it, including the largest investment in state history to bolster wildfire resilience, funding to tackle the drought emergency while building long-term water resilience, and strategic investments across the spectrum to protect communities from extreme heat, sea level rise and other climate risks that endanger the most vulnerable among us.[26]

And as CARB confirms in its proposal, light duty vehicles account for 28% of California's statewide GHG emissions and 13% of statewide NOx emissions.[27] Indeed, there are compelling and extraordinary air pollution, climate change, and public health and welfare impacts to the state that result from these emissions, and they necessitate the rapid and complete electrification of the state's transportation system.

The U.S. Environmental Protection Agency (EPA) has long considered battery electric vehicles (BEVs) to be the most effective mobile source pollution mitigating technology, stating over a decade ago, "From a vehicle tailpipe perspective, EVs are a game-changing technology."[28] Recently, in a detailed study, the National Academies of Sciences deemed BEVs the greatest opportunity to improve the energy efficiency of light-duty vehicles — i.e., passenger vehicles and light trucks — over the period of 2025-2035, as well as to reduce greenhouse gas pollutants from this sector.[29] Additionally, study after study shows BEVs are a superior technology for reducing air pollution and GHG emissions on their lifetime.[30] On well to wheels analysis including upstream emissions, the U.S. Department of Energy (DOE) has repeatedly found BEVs to be far superior in emission performance than internal combustion engine (ICE) technology.[31] Moreover, as the carbon intensity of domestic electricity generation continues to decline, BEV emission performance becomes better and better over time.[32]

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[26] Office of the Governor, Governor Newsom Signs Climate Action Bills, Outlines Historic $15 Billion Package to Tackle the Climate Crisis and Protect Vulnerable Communities (Sept. 23, 2021).
[27] CARB, Advanced Clean Cars (ACC) II Workshop Presentation (Sept. 16, 2020) at 5.
[28] 77 Fed. Reg.62624, 62815.
[29] National Academies of Sciences, Zero Emission Vehicles Represent the Future of Energy Efficiency, Petroleum and Emissions Reductions in 2025-2035, New Report Says (Mar. 31, 2021); See also, 42 U.S.C. §7521(c) (recognizing NAS' role in informing standards under Section 202).
[30] See e.g., ICCT, A global comparison of the life-cycle greenhouse gas emissions of combustion engine and electric passenger cars (July 20, 2021); National Academies of Science, Accelerating Decarbonization of the U.S. Energy System (Feb. 2, 2021) at 97 ("Further, light-duty trucks and buses should be electrified, particularly in urban areas. Over the next decade, the United States needs to ensure that electric vehicles become the predominant share of new purchases."); Environment International, Assessing the health impacts of electric vehicles through air pollution in the United States (Nov. 2020).
[31] See Department of Energy, Alternative Fuels Data Center, Emissions from Hybrid and Plug-In Electric Vehicles
[32] See U.S. EIA, Annual Energy Outlook 2021 (Feb. 2021) at 16.

Tesla believes that the transition to a fully electrified light duty vehicle sector can and will happen even quicker than CARB anticipates. As demonstrated by the Model 3 being the world's best-selling premium sedan and the Model Y becoming one of the top selling SUVs in the country, consumers continue to embrace electric vehicles. As a leading automotive trade group recently touted, "consumer interest is growing because these vehicles are reliable, efficient, safe, and particularly fun to drive."[33] Indeed, there is widespread public support for policies that support the transition to ZEVs and consistently growing consumer interest in EV purchases. A recent survey found that almost 56% of consumers already are likely to buy a hybrid or electric vehicle for their next car purchase and over 40% think green-conscious cars will outnumber gas-powered cars in the U.S. by 2030.[34] Tesla believes that more stringent standards can appropriately set the pathway to encourage widespread deployment of ZEVs and set the stage for a fleet-wide light-duty vehicle standard of 0 g/mi CO2 starting in MY 2030 (i.e., 100% EV sales by 2030).

III. Comments Regarding CARB's Draft ACC II Regulations (April 15, 2022 Proposal)

1. Appendix A-5 Draft Amendment: § 1962.4. Zero-Emission Vehicle Standards for 2026 and Subsequent Model Year Passenger Cars and Light-Duty Trucks.

A. The Proposed Compliance Flexibilities Would Dramatically Reduce the Annual Percentage of Actual ZEV Deliveries and Thereby Jeopardize the Objective of These Regulations.

Tesla shares the State of California's air quality, clean transportation, and climate goals, and applauds the direction of the Governor's Executive Order (EO, N-79-20). To ensure that the state remains a world leader in pollution reduction, Tesla believes that with modest technology and price improvements to electric vehicles, 100% ZEV sales by 2030, five years ahead of the proposed regulations, is achievable for the ACC II standard. Tesla agrees with CARB that BEV technology is proven and rapidly improving, battery costs are falling, and the BEV markets are rapidly expanding.[35] In the first quarter of 2022, BEV sales rose by 60% while the overall vehicle market declined 18%.[36]

As proposed, the ACC II standards seek to take some substantial steps forward in electrification starting in Model Year (MY) 2026. CARB's topline of the proposal is anchored in requiring 35% ZEV sales in MY 2026, however, the extensive compliance flexibilities offered in the proposal will significantly reduce this stringency, and per Tesla modeling, could result in real world, MY 2026 ZEV deployment of an estimated 16%. *See Figure 1*. While the topline takeaway of the ACCII proposal suggests a 35% MY 2026 starting point escalating to 100% by 2035, due to compliance flexibilities including the use of historical credit banks (-5%), plug-in hybrid (PHEV) permissibility (-7%), Environmental Justice (-2%) and Early Compliance credit options (-5%), if all compliance flexibilities are utilized which most should be as elaborated upon more below, the actual implied stringency in MY 2026 is 16% in real world sales versus the 35% stringency standard, a far less ambitious outcome than Tesla believes should be intended to realize the emissions reductions sought. *Figure 1* below continues to show the compliance flexibility impacts on the overall stringency YoY which can be better understood by comparing the "ACC II Proposal" line with the "Implied actual ZEV/PHEV sales" line. The final regulations should be amended to

[33] Alliance for Automotive Innovation, Accelerating the Transition to Electric: EV infrastructure and Consumer Acceptance (Sept. 7, 2021).
[34] CarMax, Green-Conscious: Exploring Americans' Views on Hybrid and Electric Vehicles (Aug. 23, 2021).

[35] See generally, ISOR at 13-20
[36] Car & Driver, Electric Cars' Turning Point May Be Happening as U.S. Sales Numbers Start Climb (May 14, 2022); Automotive News, U.S. EV registrations surge 60% in Q1, driven by Tesla, Ford, new Korean models (May 10, 2022).

assure that CARB's ambitious goal are realized in actual vehicle deployment and not just annual credit compliance reports.

Figure 1: Impacts of Proposed Compliance Flexibilities on Actual ZEV/PHEV Deployment

Impact of compliance flexibilities on stringency

Assuming all compliance flexibilities maximized

ZEV/PHEV share (%)	Annual Allowance	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
ACCII Proposal		**35%**	**43%**	**51%**	**59%**	**68%**	**76%**	**82%**	**88%**	**94%**	**100%**
Converted (historical) credits	15%	-5%	-6%	-8%	-9%	-10%					
PHEV contribution	20%	-7%	-9%	-10%	-12%	-14%	-15%	-16%	-18%	-19%	-20%
Environmental Justice Allowance	5%	-2%	-2%	-3%	-3%	-3%	-4%				
Early Compliance Vehicles	15%	-5%	-6%	-8%							
Implied actual ZEV/PHEV sales		**16%**	**19%**	**23%**	**35%**	**41%**	**57%**	**66%**	**70%**	**75%**	**80%**
Tesla Proposal (real ZEV sales)		**35%**	**51%**	**67%**	**84%**	**100%**					

Source: Tesla analysis

Indeed, the Governor and California Energy Commission recently trumpeted that California ZEV sales has already hit 16%[37] with more than 82% of those ZEV sales being BEVs.[38] By direct comparison, our analysis shows that the MY 2026 real world draft ACC II regulation stringency, still several years away, starts at the same 16%. This falls short of other proposals across the world. For example, the U.K. will achieve 22% BEV sales in 2024[39] and the E.U. will achieve it in 2025.

In light of this rapid market expansion, the proposal does not reflect real world delivery and in its current form would accomplish only minor increases in ZEV penetration in MY 2026. Given the acceleration of public health and welfare impacts associated with criteria emissions and climate change, it is incumbent upon CARB to recognize the appropriate level of ZEV technology that can be delivered at the start of ACC II and it should inform the implementation of a more stringent standard.

Consistent with this pathway Tesla recommends CARB increase the stringency of the ZEV standard by raising the annual targets by 8% each year from the proposed levels starting with MY 2027 requirement rising to 51% (MY 2028 to 67%; MY 2029 to 84%; and MY 2030 to 100%).[40] These targets are more than reasonable given the current state of ZEV sales and reductions in real ZEV deliveries that occur, as described below, under the proposed flexibilities.

Further, while Tesla supports some compliance flexibilities, as described below CARB should reorient some of the proposal's flexibilities to ensure greater real world ZEV deliveries. To mitigate the substantial erosions in actual ZEV deliveries that will occur under the current proposal, Tesla suggest that CARB institute an overall limit on total annual flexibility utilization to 20% for each compliance model year. As Tesla's modeling in Figure 2 shows, instituting such an annual limit on credit utilization could dramatically increase actual deployment of ZEVs each model year and provide greater alignment with the Governor's executive order.

[37] Office of Governor Newsom, As Statewide ZEV Sales Exceed 16 Percent of All New Vehicles, California ZEV Program Surpasses 250,000 Point-of-Sale Incentives (May 10, 2022).
[38] California Energy Commission, New ZEV Sales in California (Q1 2022).
[39] See, U.K. Department of Transport, Technical consultation on zero emission vehicle mandate policy design (April 2022) at 11, Section 2.13.
[40] Proposed §1962.4(c)(1)(B).

In addition to creating a 20% total annual flexibility utilization limit, Tesla suggests sunsetting the PHEV flexibility after MY 2030 given the emissions implications, as explained further below, of PHEV technologies. In combination, these flexibility changes would result in real-world implied actual 100% emissions-free ZEV sales by 2035. *See Figure 2.* Without these changes, the continuation of the PHEV contribution in perpetuity may result in a 20% shortfall from reaching full emissions-free ZEV sales. *See Figure 1.*

Figure 2: Impacts of Tesla's Proposed Compliance Flexibilities on Actual ZEV/PHEV Deployment

Impact of compliance flexibilities on stringency (with Tesla proposals)

Assuming all compliance flexibilities maximized

ZEV/PHEV share (%)	Annual Allowance	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
ACCII Proposal		**35%**	**43%**	**51%**	**59%**	**68%**	**76%**	**82%**	**88%**	**94%**	**100%**
Converted (historical) credits	15%	-5%	-6%	-8%	-9%	-10%					
PHEV contribution	15%	-5%	-6%	-8%	-9%	-10%					
Environmental Justice Allowance	5%	-2%	-2%	-3%	-3%	-3%	-4%				
Early Compliance Vehicles	15%	-5%	-6%	-8%							
Total Annual Flexibility Utilization	**20%**										
Implied actual ZEV/PHEV sales		**28%**	**34%**	**41%**	**47%**	**54%**	**72%**	**82%**	**88%**	**94%**	**100%**
Tesla Proposal (real ZEV sales)		**35%**	**51%**	**67%**	**84%**	**100%**					

Source: Tesla analysis

1. **Historical Credits – The Proposed Rebalancing of the Existing ACC I Credits Disproportionately Favors Plug-in Hybrids (PHEVs).**

Tesla supports CARB's efforts to both simplify the vehicle accounting and to ensure that over compliance prior to MY 2026 does not threaten ZEV deployment goals of the ACC II program. As the largest generator of ZEV credits under ACC I, Tesla supports CARB's efforts to address the backsliding that could occur given the excess credit banks that will have built up at the end of MY 2025.

Unfortunately, under proposed §1962.4(g)(2), CARB's proposed conversion rate of banked credits carried into the ACC 2 compliance period significantly tips the balance to favor PHEV deliveries over BEV deliveries through MY 2025. BEV credits that accumulate under ACC I at a rate up to four credits per vehicle are converted to actual vehicle sales by dividing by four. In contrast, PHEV credits that accumulate on a one for one basis are converted by dividing by only 1.1. This results in ACC II increasing the relative credit value of PHEVs compared to ZEVs. For example, if a manufacturer sold both a 1000 BEVs and PHEVs in ACC 1 the manufacturer would accumulate approximately 4000 credits for the BEVs and 1000 credits for the PHEV. Under the proposal, these credits will be converted to 1000 BEV credits and 909.1 PHEV credits. This conversion rate incentivizes manufacturers to focus deliveries on PHEVs because the PHEV qualifications are less stringent now under ACC I, PHEVs are comparatively cheaper to manufacturer than BEVs, and the conversion rate in MY 2026 outweighs the value of PHEVs compared to BEVs. Moreover, the PHEVs that generate credits prior to MY 2025 will be more polluting as the increased PHEV performance requirements do not start until MY 2026.[41] CARB should address the skewed incentive by amending the PHEV conversion rate, maintain the relative credit status quo in ACC I, and, as with ZEV, utilize a PHEV conversion denominator of 4.

CARB caps the annual use of historic credits to 15% of the annual requirement and retires these credits after MY 2030, but this cap combines both historic BEVs and PHEVs credits. Thus, the cap does not address this newly created incentive toward near term PHEVs credit banking. Given the goal of ACC II is to accelerate emissions-

[41] See proposed §1962.4(e)(1)(A).

free technologies and real-world studies demonstrate that current technology is far more polluting than realized,[42] CARB could more fulsomely incent this by capping BEV and PHEV historic credit use separately with a cap of 10% for BEVs and 5% for PHEVs.

(A). CARB Should Not Establish a Cumulative Cap for Historic Credits

Similarly, CARB should also not entertain any loosening of the annual cap under this provision. Creation of a cumulative historical credit cap over five years to be used in any amount during a single model year prior to 2031 would severely dampen near-term delivery of ZEVs. A cumulative cap further extends the lifetime of historic credits generated in past years and would reward manufacturers that have not adequately moved to deploy technologies in CA to meet the ACC I performance standards.

Additionally, the credit lifetime extension will also lessen the immediate value of earned credits in the trading market as underperforming manufacturers now may have greater opportunity as to when to utilize those compliance credits. Under a cumulative historical credit cap, the immediate need for credit market transaction will diminish, meaning less revenue and opportunity for over-performing manufacturers that seeks to utilize credit revenue sales to invest in increased manufacturing of advanced technology vehicles. In other words, a cumulative historical credit cap would reward inaction by underperformers while undermining the potential for those performing as the regulation intended. Contrary to the ACC II goals, a cumulative historical credit cap will diminish the level of investment going back into advanced manufacturing, and only serves to reward those manufacturers that delay deploying advanced technologies.

2. CARB Should Substantially Reduce the PHEV Allowance Flexibility – Proposed §1962.4(e)(1)

This proposal overly incentivizes continued investment in a polluting technology, prolongs emissions, and will result in a disproportionate number of new PHEVs in the state's overall vehicle fleet, potentially displacing what otherwise would be greater, cleaner BEV adoption.

PHEVs are a still polluting vehicles with emissions that can be greater than that of a highly efficient gas cars.[43] In a 2020 study, the International Council on Clean Transportation (ICCT) found that real-world PHEV fuel consumption and emissions were about 2-4 times higher than certified levels.[44] According to ICCT, one of the main reasons for this is that, "For private cars, the average utility factor (UF)—an expression for the portion of kilometers driven on electric motor versus kilometers driven on combustion engine—is 69% for New European Drive Cycle (NEDC) type approval but only around 37% for real-world driving. For company cars, an average UF of 63% for NEDC and approximately 20% for real-world driving was found."[45] Essentially, PHEV drivers utilize ICE engines for travel far more than electric drive when operated in real world conditions. Similarly, Transport and Environment found that emissions from three of the most popular PHEVs in the EU were 28-89% higher than certified levels even under ideal test conditions (e.g., fully charged battery).[46] Other studies suggest hybrids offer

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[42] ICCT, Real-World Usage of Plug-In Hybrid Electric Vehicles: Fuel Consumption, Electric Driving, and CO2 Emissions (Sept. 27, 2020).
[43] See National Academies of Sciences, Zero Emission Vehicles Represent the Future of Energy Efficiency, Petroleum and Emissions Reductions in 2025-2035, New Report Says (March 31, 2021) at 5-77 (reporting the result that EVs have approximately 54 percent lower CO2 than average U.S. vehicles, and 26 to 31 percent lower than hybrids, within the same vehicle class. EVs on a California grid, reflective of decarbonization trends, have 70 percent lower CO2 emissions than the U.S. average.)
[44] ICCT, Real-World Usage of Plug-In Hybrid Electric Vehicles: Fuel Consumption, Electric Driving, and CO2 Emissions (Sept. 27, 2020).
[45] Id. at 1.
[46] Transportation & Environment, Fixing the PHEV loophole (Dec. 2021);See also, CleanTechnica, Plugin Hybrid Cars Pollute 200–400% More Than Official Ratings (Feb. 13, 2022)

little benefit compared to ICE vehicles.[47] Even CARB staff has shared these concerns in previous ACC II workshops calling out excessive PHEV cold start emissions.[48]

In addition to overvaluing PHEVs in the conversion of ACC I's historical credits, the ACC II proposal further incentivizes PHEV technology in several other ways. CARB over credits PHEVs relative to ZEVs, provides a MY 2026-2028 relaxation of the qualifying technology standards for PHEVs, and allows a huge 20% of the annual compliance requirements to be met with this still polluting technology in perpetuity. If CARB seeks a zero emission, fully electrified light-duty sector, it should significantly lower the role of PHEV in the final regulation, allowing diminishing PHEV percentages over time and phasing them out after 2030.

First, in comparison to the ACC I ZEV program, CARB proposes to over-credit deployed PHEVs in ACC II. Under ACC I, a PHEV could earn up to 1.1 credits while a BEV could earn up to 4 credits. Under the ACC II proposed § 1962.4(e)(1), eligible PHEVs can earn one credit, however, BEV credit generation has been discounted from 4 credits to 1 credit. In short, CARB failed to keep the same weight of credit generation ratio. Using the existing ACC I crediting ratio, if the average BEV earns 1 credit, then the average PHEV should earn a maximum of 0.3 credits per vehicle in ACC II. As a result, CARB has tipped the scales decidedly in favor of PHEVs.

Second, under the ACC II proposed § 1962.4(e)(1)(B), eligible PHEVs with a reduced range stringency are still able to earn one credit for each PHEV delivered through MY 2026 – 2028.[49] In doing so, CARB's proposal rewards vehicles with diminished emission reduction benefit with the approximate equivalent credit value of a ZEV that must meet far greater technical standards. Rather than serve as an incentive, this will further delay manufacturers from deploying large numbers of BEVs in California.

Third, CARB further proposes in § 1962.4(e)(1)(C) to allow manufacturers to use these early year, limited range PHEVs and, after MY 2028, all qualifying PHEVs toward 20% of their annual compliance. There is little doubt many manufacturers will deploy PHEVs to maximize cheaper credit generation up to the 20% limit throughout the lifetime of the ACC II program. In the E.U, a similar "Super Credit" multiplier exists for vehicles which emit <50g CO_2/km, which can be earned from 2020-2022 inclusive. In the *first year* of the Super Credit eligibility, eight out of ten manufacturers reached the cap.[50] This was achieved by aggressive sales practices (pricing and pre-registrations) to capture the maximum value of the credits up to the cap, and then halting further sales once the cap was reached.

Allowing PHEV crediting at the proposed high rate will result in a disproportionate number of new PHEVs in the state's overall vehicle fleet that will displace what otherwise would be cleaner BEVs that perform far better on emission reductions and certified electric range. Tesla's modeling indicates that generation of PHEV credits under this flexibility will increasingly reduce real world ZEV deployment by 7% in MY 2026 and rising to a full 20% by 2035. *See Figure 1.*

Accordingly, Tesla urges CARB to reduce the level of credit generation that unfairly rewards polluting PHEV technology. Tesla urges CARB to adjust the PHEV credit generation downward consistent with the ratio between BEV and PHEVs under ACC I. Further, Tesla believes the annual cap on the use of PHEV credits should be set at a maximum of 15% annually and eliminated beginning in MY 2031. *See Figure 2.*

3. Environmental Justice Credit Proposals Should Not Result in Reduced Stringency

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[47] See e.g., Impact Living, Study on the consumption of plug-in hybrid vehicles in Valais topography (Jan. 11, 2022).
[48] CARB, Advanced Clean Cars (ACC) II Workshop Presentation at 27 (May 6, 2021).
[49] ISOR at 58
[50] ICCT, CO_2 emissions from new passenger cars in Europe: Car manufacturers' performance in 2020 (August 2021) at 4, Table 1.

Communities of color disproportionately bear the impacts of air pollution[51] and Tesla shares CARB's goal of addressing these issues, in part, by increasing penetration of EVs in underrepresented communities. As CARB highlighted in its August 2021 workshop, this goal cannot be achieved without increasing consumer access to EVs, especially for those most negatively impacted by the effects of air pollution and climate change. Tesla is hard at work on battery cell innovations that we expect will lower kWh battery costs by over 50% and make purchases of EVs more accessible.[52] The Model 3 currently retails for less than the average $47,000 cost of a new light-duty vehicle in the U.S.[53] Tesla is also continually advancing manufacturing efficiencies, including at our new factories coming on-line this year, and localizing supply chains to drive down costs so it can make EVs accessible to as many people as possible. Further assisting in the accessibility of EVs, these vehicles are cheaper to operate[54] and the total cost of ownership of and EV has already surpassed that of an ICE.[55]

Tesla notes that the California Clean Vehicle Assistance Program (CVAP)[56] has been successful in delivering grants for over 3200 EV purchases and made 2725 charging grants.[57] Tesla signed on to be part of the program in July 2020. Since that time the program has made grants facilitating 2966 EV purchases with 2161 (73%) being Tesla vehicles.[58] Of these Tesla vehicles, sixty percent were sales to people with annual gross income below $45,000.[59] While outside the purview of this proposal, expanding CVAP can assure greater access to new, high-quality EVs for low-income households.

In addition, Tesla encourages CARB and California policymakers to address a number of significant inequities that are present in the vehicle market, disproportionately harm communities of color, and lessen access to new vehicles. For example, studies show that African Americans and Hispanics and Latinos face higher car financing costs even when their credit scores, income, and other indicators of credit worthiness are just as good as Whites'.[60] A 2018 study detailed that 62.5 percent of the time, Non-White testers who were more qualified than their White counterparts received more costly pricing options when purchasing a vehicle.[61] This is among the reasons Tesla has price transparency, does not mark up financing rates during purchase, and believes its direct sales model is the most equitable way for anyone to purchase a vehicle. While addressing these discriminatory sales practices may be outside the purview of the ACC II regulation, CARB should urge action to remove these barriers to facilitate greater access to EVs.

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[51] See, e.g., Environmental Health Perspectives, Disparities in Air Pollution Exposure in the United States by Race/Ethnicity and Income, 1990–2010 (Dec. 15, 2021); Science Advances, $PM_{2.5}$ polluters disproportionately and systemically affect people of color in the United States (Apr. 28, 2022); American Lung Association, Disparities in the Impact of Air Pollution (Apr. 20, 2020).
[52] Tesla, Battery Day Presentation (Sept. 22, 2020).
[53] Kelley Blue Book, Average New Car Price Tops $47,000 (Jan. 14, 2022).
[54] Zero Emission Transportation Association, It's cheaper to drive an EV than a gas-powered car (Jan. 14, 2022).
[55] See, Energy Innovation, Most Electric Vehicles Are Cheaper to Own Off the Lot Than Gas Cars (May 13, 2022); Consumer Reports, EVs Offer Big Savings Over Traditional Gas-Powered Cars (Oct. 8, 2021); We Predict, We Predict Deepview True Cost: After Higher First Year Costs, EV Service Costs Fall 30% Below Gas Vehicle Costs at Three Years Oct. 28, 2021); See also, McKinsey, The economic transformation: What would change in the net-zero transition (Jan. 25, 2022).
[56] California Clean Vehicle Assistance Program.
[57] See CVAP, Program Data.
[58] Id.
[59] Id.
[60] National Consumer Law Center, Time to Stop Racing Cars: The Role of Race and Ethnicity in Buying and Using a Car (April 2019).
[61] National Fair Housing Alliance, Discrimination When Buying A Car: How the Color of Your Skin Can Affect Your Car-Shopping Experience (January 2018).

As to the draft proposal, Tesla shares the goals and benefits, if realized, of the Community and Used EV proposals found at §1962.4 (e)(2). Tesla encourages CARB to implement these Environmental Justice (EJ) proposals without impacting the overall stringency of the program.

As CARB has proposed, the implementation of the EJ flexibilities would lower the stringency of the ACC II program by between 2 and 3% annually from MY 2026 to 2031.[62] Given the broad definition of credit generation activities that qualify as a "Community-based clean mobility program,"[63] many manufacturers will maximize implementation these activities that are cheaper than delivery of actual BEVs. Accordingly, Tesla's modeling also finds that utilization of this flexibility will reduce real world BEV deployment by between 2 to 3% each year through MY 2031. *See Figure 1.*

Reducing the proposed stringency of the overall program lessens the mitigation of the very air pollution impacts in the communities that CARB seeks to address. In this regard, CARB should prevent such backsliding and raise the overall model year ZEV requirement commensurate with the amount of stringency reduction created by the implementation of the EJ credit flexibility programs.

(A). Design of the Program May Exacerbate Vehicle Ownership Inequities

Under the proposed Community-based Clean Mobility Programs, CARB attempts to increase EV accessibility through a crediting incentive to manufacturers that, inter alia, provide vehicles 25% below MSRP. It is unclear whether structuring the incentive this way will be equitable and deliver both greater numbers and desirable vehicles to the targeted communities. First, requiring a manufacturer provide a MSRP discount does not mean an actual discounted sale will happen at the dealership.[64] Second, the program will likely lead to many OEMs providing compliance EVs that possess the lowest qualifying range being delivered to eligible communities as the most "cost-effective" way for manufacturers to capture the allowable credits. This may only serve to exacerbate the divide as to who is able to obtain new EVs with the attributes that most consumers desire.

Indeed, §1962.4(e)(2)(c) adds a .10 "kicker" for EVs delivered below an even lower MSRP. CARB should seek to assess whether, as structured, a quality and performance gap will be created for those who purchase a vehicle through the Clean Mobility Programs. As noted above, as currently structured, with CVAP focusing on AGI and not MSRP, it ensures that there is access to BEVs of all qualities to low-income households and does not create a reward for delivering EVs of lesser capability.

(B). The Used EV Program Should Expand Eligibility

As proposed at §1962.4(e)(2)(B), used EV eligibility is limited to formerly leased vehicles from MY 2026-2031. Tesla sees no reason why the program should be cabined to only used vehicles that were leased versus other manners of prior ownership. So long as an OEM retains ownership prior to resale to a qualifying applicant, form of prior ownership should not preclude eligibility and this limitation will unnecessarily limit the pool of eligible used EVs available.

Rather than focus eligibility on the original MSRP of the vehicle, Tesla also recommends CARB consider relying on purchaser criteria adopted by air districts under Clean Cars 4 All.[65] Furthermore, the proposed 0.10 credit per

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[62] CARB, Advanced Clean Cars (ACC) II Workshop (Aug. 11, 2021) at 33.
[63] Proposed 1962.4(l).
[64] See, Washington Post, Car dealers are raising prices. Automakers are pushing back. Consumers are stuck in between (Feb. 12, 2022).
[65] Bay Area Air Quality Management District, Clean Cars 4 All, Eligibility.

used EV may not be sufficient to encourage manufacturer participation. The same can be said for the .10 credit "kicker" for vehicles below the MSRP.

Finally, as discussed earlier, any increase in the new or used vehicle EJ credit value, however, should occur only in lockstep with an increase in the overall ZEV program stringency to account for the overall increase in emissions allowed by this credit generation flexibility.

4. Early Compliance Credits Should Not Erode Overall Stringency

Under proposed §1962.4(e)(3), CARB would create a new early compliance credit generation program. As structured, CARB's proposal allows manufacturers that have more than 20% California ZEV sales in MY 2024 and 2025 to generate early compliance credits. This aspect of early compliance crediting is a reasonable means of pulling forward actual ZEV deliveries. It rewards OEMs that have moved rapidly to expand their ZEV offerings and exemplify near term action toward compliance with ACC II.

The incentive does impact the near-term stringency of the ACC II program as manufacturers will be incentivized to produce more than 20% ZEVs in MY 2024 and MY 2025, but likely will dampen MY 2026 and 2027 production. Many manufacturers will not be compelled to significantly expand MY 2026 and 2027 production as the accumulated early action credits will fill the gap between the more than 20% production level in 2024 and 2025 and the need to meet only a 35% target in 2026. The gap between over 20% and 35% will be easily filled using the accumulated early action credits and other credit flexibilities, and likely, not more actual ZEVs. CARB can cure this erosion of stringency by raising, as Tesla suggests, the annual model year ZEV percentage requirements, and by not incentivizing further MY 2024-2025 PHEV deployment by making only BEVs eligible for the early action crediting.

5. Section 177 State Pooling Allowed MY 2026-2030

Tesla also supports CARB's proposal to allow time-limited state pooling to ease ACC II adoption concerns in Section 177 states. Tesla concurs that pooling – unlike proportional crediting schemes – can maintain stringency by ensuring that credits only accumulate when actual ZEVs are delivered. To that end, any existing proportional credits created in a state adopting ACC I, thereby duplicating or double counting vehicles delivered in California as they were delivered in other states at the same time, should not be eligible for any pooling in ACC II.
Tesla further believes that the program could accelerate further Section 177 ZEV deployment by lowering the pooling cap levels by 5% each year from the proposed levels and ending after MY 2029.

6. CARB Correctly Adjusts the Enforcement Civil Penalty

Tesla supports CARB's proposal to ensure the existent penalties[66] are adjusted to provide an appropriate deterrent from non-compliance. As drafted, the proposed §1962.4(m)(3) civil penalty adjustment, when combined with the proposed model year standards, will created a stable regulatory environment under which all auto manufacturers can exercise their business judgment on the level of investment in the technology and innovation needed for their fleets to meet new ZEV standard equivalent.

B. ZEV Assurance Measures

As noted in our past comments, Tesla agrees with CARB that building ZEV consumer assurance is an important factor towards achieving significantly higher levels of ZEV penetration, including in the secondary market. CARB,

[66] Cal. Health & Safety Code, § 43211.

however, should recognize the significant progress in EV market that has been made with minimal regulation over issues such as range and battery durability. For example, over the course of ACC 1 program both the maximum and median range of the fleet have continued to increase annually with a median range now exceeding 250 miles.[67] This trend is expected to continue with most, if not all, recently announced EVs, having a range of 200 miles or more with optional packages well above 200 miles.[68]

Tesla has also proven that EV consistently enjoy an overwhelmingly positive customer satisfaction ratings[69] and has an unparalleled and unique relationship with our customers, most of whom are first time EV owners. Moreover, recent surveys have found that 96% of current EV owners are likely to purchase an EV as their next vehicle.[70] These achievements reflect significant consumer assurance in EVs with minimal regulatory intervention.

Tesla respectfully urges CARB to avoid inadvertently disrupting this accelerating trend by creating additional and unnecessary costs and barriers to consumer adoption and potential unintended consequences. While Tesla agrees that minimum range and battery warranty requirements are appropriate, other aspects of CARB's proposal—such as battery durability requirements, adapter and charging cord requirements, and other measures—are likely to have a net negative impact. These requirements would not lead to a meaningful marginal change in ZEV use or adoption, and thus any minimal incremental emissions reduction is not cost effective compared to the costs imposed by these requirements. BEV consumers are not likely to make purchase or use decisions based on these requirements in any meaningful number, any such decisions made by some consumers would be offset by decreased purchases by others due to higher prices, any incremental purchase or use changes in consumer activity would result in very marginal emissions reductions, the requirements would be unduly costly, and the requirements impede on areas where competitive advantage otherwise would create solutions that would become available to consumers.

1. Raise Minimum Range Requirement Beyond 200 miles

Tesla believes the proposed 200-mile minimum range (2-cycle) or 150-mile label range (real world conditions) for BEVs is not rigorous enough. During the August 2021 workshop CARB staff presented that the median label range was is 310 miles in 2018.[71] The U.S. Department of Energy (DOE) reports that both maximum and median range of EVs continued to increase through 2020.[72] And the EPA recently reported that, "The average range of new EVs has climbed substantially. In model year 2020 the average new EV is projected to have a 286-mile range, or almost four times the range of an average EV in 2011."[73]

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[67] U.S. Department of Energy, FOTW# 1167, January 4, 2021: Median Driving Range of All-Electric Vehicles Tops 250 Miles for Model Year 2020 (Jan. 4, 2021).
[68] See e.g., Car and Driver, Every Electric Vehicle That's Expected in the Next Five Years (Jan. 6, 2022).
[69] Charged, J.D. Power survey finds new EV owners "highly satisfied," Tesla leads rankings (Feb. 6, 2022); J.D. Power, Making Electric Vehicle Leap of Faith is Highly Satisfactory to New Owners, J.D. Power Finds (Jan . 27, 2022);Consumer Reports, The Most and Least Liked Car Brands: Rankings based on Consumer Reports' owner satisfaction survey (Feb. 1, 2022)(This year Tesla again tops our brand-level satisfaction ranking); Consumer Reports, 10 Top Picks of 2020: Best Cars of the Year (Feb 20, 2020) (Model 3 received top honors); Inside EVs, Consumer Reports Study Ranks Tesla Model 3 No. 1 Across All Generations (Aug. 24, 2020).
[70] Plug-In America, Satisfied Drivers, Optimistic Intenders (Feb. 25, 2021)
[71] See CARB, August 2021 Advanced Clean Cars (ACC) II Workshop Presentation at Slide 39.
[72] U.S. Department of Energy, Vehicle Technology Office, FOTW# 1167, January 4, 2021: Median Driving Range of All-Electric Vehicles Tops 250 Miles for Model Year 2020 (Jan. 4, 2021)
[73] Environmental Protection Agency, The 2021 EPA Automotive Trends Report (Nov. 2021) at 58.

Raising the proposed minimum range is supported by consumer evidence suggesting greater EV adoption is supported by longer range EVs.[74] Accordingly, Tesla believes CARB should amend the draft regulation with a higher minimum range (e.g., 340 miles 2-cycle or about 225-mile label range) to meet this demand.
As a recent vehicle consumer survey found, two of the top U.S. EV adoption barriers are driving range and cost.[75] As further discussed below, increasing the minimum range of qualifying vehicles should allow CARB to set aside the unworkable and unnecessary proposed durability standard. A higher minimum range requirement will address CARB's customer assurance concerns as the vehicle range will be more than adequate even after many years of ownership. The longer the range, the less that loss of incremental capacity over time (due to expected degradation) will matter to consumers.

2. Eliminate or Reduce the Durability Requirement of 80% Retained Certified Range for 10 Years or 150,000 miles.

Under draft § 1962.4(d)(1) and (2), manufacturers face a ZEV program eligibility threshold whereby vehicles must meet a minimum certified electric vehicle range of greater than or equal to 200 miles and vehicles in a manufacturer's test group must maintain 80% or more of the certified all-electric range value for a useful life of 10 years or 150,000 miles, whichever comes first. Tesla shares CARB's interest in building EV customer assurance and increasing EV adoption. Indeed, Tesla maintains overwhelming customer satisfaction.[76] However, Tesla questions the legal authority and record basis to implement durability requirements on BEVs as well as CARB's reasoning. Indeed, CARB supports its proposal by citing one public opinion survey publication that makes no mention of battery durability.[77]

As elaborated below, the durability requirements should be removed or substantially amended.
To date, CARB has implemented requirements focused on the durability of conventional catalytic emission system of vehicles,[78] and with good reason. The goal of ensuring durability and performance of catalytic exhaust emission control technologies is to reduce tailpipe criteria air pollutant emissions. As the EPA has described:
The process of predicting how and to what degree a vehicle's emission levels will change over its useful life period [emissions deterioration] as well as the robustness of the vehicle's emission-related components [component durability] is known as an emission durability demonstration.[79]

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[74] See e.g., Consumers Report, Consumer Reports Survey Shows Strong Interest in Electric Cars (Dec. 18, 2020) (half of the drivers surveyed say they would want an EV that could travel more than 300 miles between charges).
[75] Deloitte, 2022 Global Automotive Consumer Study (Jan. 2022) at 10.
[76] J.D. Power, Making Electric Vehicle Leap of Faith is Highly Satisfactory to New Owners, J.D. Power Finds (Jan . 27, 2022) (Tesla Model 3 and Model Y rank highest); Consumer Reports, The Most and Least Liked Car Brands: Rankings based on Consumer Reports' owner satisfaction survey (Feb. 1, 2022) ("This year Tesla again tops our brand-level satisfaction ranking.")
[77] See, ISOR at 22, fn 149; at 23 fn. 161 (*citing* MacInnis, 2020, which does not include any questions or consumer references to battery durability issues.)
[78] See e.g., CARB, "Lev III" Amendments to the California Greenhouse Gas And Criteria Pollutant Exhaust and Evaporative Emission Standards and Test Procedures and to the On-Board Diagnostic System Requirements for Passenger Cars, Light-Duty Trucks, and Medium-duty Vehicles, and to the Evaporative Emission Requirements for Heavy-Duty Vehicles, Final Statement of Reasons (June 2012) at 19 ("Accordingly, in designing the emission control systems for these vehicles a balance must be struck between catalyst durability and effective emission control during both cold-start and hot running conditions under high load."); See also, Id. at 45 (discussing durability issues associated with evaporative emission controls).
[79] 71 Fed. Reg. 2809, 2811 (Jan. 17, 2006); See also, 40 C.F.R. §86-1823-08(a) ("***Durability program objective.*** The durability program must predict an expected in-use **emission deterioration** rate and **emission level** that effectively represents a significant majority of the distribution of emission levels and deterioration in actual use over the full and intermediate useful life of candidate in-use vehicles of each vehicle design which uses the durability program." (emphasis added).

In contrast, imposing durability requirements on BEVs provides no similar emissions reduction benefit. BEVs do not emit tailpipe (or evaporative) criteria pollutants and changes in battery durability and retained range do not alter this fact. While CARB makes unsupported claims that BEV durability issues may cause backsliding to ICE vehicles in the future,[80] the proposed requirements will cause greater tailpipe emissions by harming the rate of electric vehicle uptake through imposition of substantial new costs and designs with reserved battery capacity. Tesla respectfully submits that any speculative benefit from consumer assurance provisions such as durability requirements must be balanced against increase up-front costs on BEVs, which are likely to slow consumer uptake and thereby increase emissions.

As drafted, the mandated durability requirements disproportionately penalize manufacturers of longer range BEVs and threaten the ability of manufacturers to qualify many BEVs in the ZEV program. CARB should either eliminate the threshold and defer any such requirement until at least MY 2030 when CARB has adequately acquired data from the deployed BEV fleets or should amend the proposal as outlined below.
First, as structured, the durability requirement at §1962.4(d)(2), perhaps unintentionally penalizes manufacturers of longer range EVs without providing any benefit to customers. For example, a minimum qualifying ZEV of 200 miles range would need to only maintain a range of 160 miles after 10 years/150,000 miles. In comparison, if durability testing revealed that the 2021 Tesla Model 3 Standard Range Plus RWD fleet with a range of 263 miles,[81] were to fall below 210 miles of range, the vehicle model would no longer qualify for the ZEV program. This creates a perverse result. The Model 3 maintains a range above the minimum threshold for ZEV participation but is disqualified, while a vehicle having only 160 miles ranges remains compliant, even though the Model 3 provides a greater range attribute to the consumer.

To date, the absence of durability standards has not impacted the used car market for BEVs that meet CARB's proposed minimum certified all electric range value of 200 miles, as is proposed §1962.4(d)(1). These EVs continue to maintain value equally or better than ICE vehicles as the used vehicle fleet of EVs matures and the average used range has increased to about 200 miles.[82] Further, this used EV market dynamic should continue because for EVs with greater than 200 miles of range customer behavior does not change in used vehicles. Accordingly, at a minimum, CARB should amend the regulation so that a manufacturer's test group must maintain 80% or more of certified all-electric range *or a minimum certified all-electric range greater than or equal to 200 miles*. This amendment would remove the disproportionate impact on longer range vehicles and allow CARB to provide the assurance that long range vehicle durability is maintained above the original qualifying threshold found at §1962.4(d)(1).

Second, CARB should consider removing the durability requirement altogether as consumer data does not show that questions of long-term battery durability to be a concern. For example, a 2021 Autolist survey indicates that the leading consumer considerations on EV adoption focused on range, price, and charging infrastructure.[83] This same survey found that long-term considerations like resale value were much lower priorities. [84]
Not surprisingly, a recent CarMax study of consumer attitudes also found that nearly 60% of people perceived the up-front cost of BEVs as their main disadvantage and the biggest obstacle to widespread adoption.[85]
Similarly, a recent Pew Research Center study found that:

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[80] CARB, ISOR at 69, 73
[81] DOE, Fueleconomy.gov, [2021 Tesla Model 3 Standard Range Plus RWD]
[82] Recurrent, [Used Electric Car Buying Repot Q1 -2022]; See generally, Wired, [Used EVs Are in Hotter Demand Than Ever] (Nov. 16, 2021).
[83] Autolist, [Survey: Electric Vehicles' Range Jumps to Top of Priorities for Consumers] (May 3, 2021) (Range now ranks as the number one consideration for consumers looking at EVs, with 61 percent saying it was their top priority. Price (50 percent) and Charging Infrastructure (43 percent) rounded out the top three considerations.)
[84] Id. (showing resale value consideration among the lowest considerations at 9.45%).
[85] CarMax, [Green-Conscious: Exploring Americans' Views on Hybrid and Electric Vehicles] (Aug. 23, 2021).

The public's views on electric vehicles at this stage appears clear on two counts. Roughly two-thirds of Americans (67%) say that electric cars and trucks are better for the environment compared with gas-powered vehicles. But a similar share (66%) also sees electric vehicles as hitting a higher price point.[86]
These consistent findings regarding price are critical for CARB to recognize as the proposed durability standard will compel overengineering of vehicle battery packs that will significantly add to the purchase price of all electric vehicles – resulting in further raising the barriers to EV adoption, not lowering them.
Consistent with the consumer survey data, Tesla updates battery cell designs to optimize for key customer needs: Energy density (range), Fast Charging capability, and Cost. These new cell designs enable more affordable, attractive EV options, but do not necessarily optimize for lifetime. As many have observed, reductions in battery pack prices – the most expensive part of a BEV - are enabling rapid adoption of electric vehicles.[87]

Third, CARB could also lower the durability threshold to 70% retained range to be consistent with current industry warranty standards and the proposed MY 2026-2030 warranty requirement. As noted, if maintained the current proposed durability standard will significantly raise the price of EVs. Tesla is not aware of evidence from any OEM that EV battery packs can maintain the proposed 80% capacity retention over 10 years for all customer use cases. Few Tesla vehicles (or any EVs) have been on the road for 10 years and Tesla's oldest Model S vehicles are just reaching such an age. [Indeed, Tesla's latest battery designs show that Model 3/Y cells average ~92% retention after 1-3 years, with the most aggressive M3/Y customer use cases having ~85% retention after 1-3 years].

Designing a vehicle for a battery pack lifetime retention of ten years is highly uncertain and compels significant engineering tradeoffs. OEMs need to account for different customer behavior profiles and be compelled to design their products based upon the most extreme edge case of use that causes inordinate battery degradation. To meet the proposed standard OEMs would look at options such as oversizing the stored energy for a given range—substantially increasing cost, energy inefficiency, and design complexity without much customer benefit. **[**Confidential Business Information [redacted].**]** Similarly, the proposal at 80% retention and 10 years/150,000 miles will compel price increases that could severely reduce consumer uptake and equitable access to new EV models,[89] and will decrease overall sales.[90]

Indeed, CARB should amend the proposal to mitigate creation of these significant regulatory costs as they may alter the trajectory of the automobile industry's move toward full electrification. As the EPA found when modeling the recent Model Year 2023-2026 light Duty GHG standards, reducing the per vehicle cost of EVs increases the technology penetration. This increased penetration of electrified vehicle technologies when

[86] Pew Research Center, Electric vehicles get mixed reception from American consumers (June 3, 2021).
[87] See e.g., Bloomberg New Energy Finance, Hitting the Inflection Point: Electric Vehicle Price Parity and Phasing Out Combustion Vehicle Sales in Europe (May 5, 2021).
[88] ISOR at 74.
[89] See CARB, August 2021 Advanced Clean Cars (ACC) II Workshop Presentation at Slide 12 (noting ZEV affordability is a concern from community and environmental justice advocates); See also, U.S. Environmental Protection Agency, Revised 2023 and Later Model Year Light Duty Vehicle GHG Emissions Standards: Regulatory Impact Analysis (December 2021) at 4-36 (finding higher battery costs have the effect of reducing BEV penetration and increasing the technology (and costs) of other vehicles).
[90] See, Id., EPA at 8-8 (conservatively utilizing a -0.4 new vehicle demand elasticity).

combined with high regulatory compliance values of BEV technology (as is the case in the ZEV proposal) will also direct manufacturers to redirect technology R & D away from conventional, non-electrified gasoline and diesel vehicles towards increased electrification.[91]

In sum, the proposed regulations are neither necessary, feasible, and nor cost-effective, and can harm the maximum emissions reductions needed to meet ambient air quality and GHG emission obligations.[92] Absent amending §1962(d)(2), CARB will have unintentionally created a significant barrier to increased BEV adoption without providing any discernible consumer benefit. If CARB wants to study the most effective consumer assurance measures, it can do so by replacing the durability requirement with a reporting system and revisit the issue after Model Year 2030.

More directly, CARB can prevent unintentionally depressing ZEV uptake from occurring by amending the proposed durability regulation in one of three ways:

- Maintaining the marketplace status quo by removing the durability requirement in its entirety and raising the minimum range requirement;
- Lowering the durability range retention threshold to 70% so that manufacturers are not compelled to add unnecessary and additional battery capacity to their vehicles; *or*
- Maintaining the proposed durability range retention threshold of 80% but also allowing OEMs to remain compliant by maintaining a durability standard of equal to or greater than 200 miles range over the 10 year/150,000 miles period.

(A). Encouraging Hidden Capacity Provides No Consumer or Environmental Benefit

As proposed at §1962.5(c)(4)(A)(4)(d), manufacturers would be able overcome the durability threshold by creating larger batteries with hidden capacity that can slowly be accessed as the battery degrades. Encouraging this approach is fundamentally flawed. BEV customers, just like other heavy-duty customers, will have guarantees of performance from the manufacturer. In adding new product specifications, the agency is just adding cost for more performance than what the customer/company wanted in the vehicle. Further, compelling oversized battery packs will also significantly and unnecessarily raise BEV prices and dampen deployment of the best emissions reduction technology currently available. In addition to cost and range, the hidden capacity approach negatively impacts other product performance metrics (such as range recovered during a fast-charging event). All it does it take away utility, and further emission reductions, at the beginning of life to give customers a manufactured sense of stability. Allowing full access to the battery (with reliable energy estimation) allows for maximum utility of deployed products over the entire life - something that is fundamental to the Tesla customer experience and should be present in good public policy.

(B). The Durability Burden Is Not Mitigated by Test Group Definitions

Tesla appreciates CARBs attempt, at proposed 1962.7(e)(2)(D)(2), to mitigate the durability burden by limiting testing sampling group to exclude use cases that defy normal driving, charging conditions, and regular vehicle battery use. However, the subjective nature ("good engineering judgment") of excessive use cases provides little clarity to manufacturers on how to design their vehicles. For example, does this definition mean vehicles that have fast charging usage rates in the 25th percentile or 5th percentile?

Similarly, the "reasonable foreseeability" of specific use cases of vehicle-to- grid, DC charging, and high temperature usage will be interpreted differently by different OEMs. Rather than thread an unthreadable needle, as discussed above, CARB would be best served to remove the durability requirement altogether or

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[91] Id. EPA at 4-22.
[9292] See CARB, ISOR at 70, fn. 334.

pause its implementation until after MY 2030 so that better battery durability and usage data are available to inform such a requirement.

3. Appendix A-4 Draft Amendment: § 1962.3. Electric Vehicle Charging Requirements

A. CARB Should Adopt a Reasonable Alternative to Its Unnecessary Proposed CCS1 Adapter Requirement

As previously communicated in Tesla's October 16, 2020 workshop comments, Tesla recognizes CARB's interest in adopting a direct current fast charging (DCFC) standard, which is not present today. However, Tesla opposes the proposed requirement at §1962.3(c) as currently drafted. The proposal would require Tesla to either alter the charging inlet manufactured as part of a Tesla vehicle or provide every Tesla customer with a CCS1 adapter. These requirements will inequitably add costs to Tesla vehicles, result in thousands of unutilized CCS1 adapters, not facilitate a meaningful increase in vehicle charging access, and penalizes Tesla as a technology leader and innovator. As provided below, Tesla proposes amending the proposal to permit OEMs to allow purchasers to opt-out of adapters at the point of sale or offer adapters as an accessory, and in the alternative, remove the requirement and revisit the issue prior to MY 2026.

Access to an extensive, convenient, and reliable fast-charging network is critical for large-scale EV adoption. That's why, since opening its first Superchargers in 2012, Tesla has been committed to and invested extensively in a rapid expansion of its proprietary network, as CARB has acknowledged in other areas of its reasoning.[93] In 2010, as Tesla designed the Model S, it identified the need to provide both AC charging and DC fast charging for the vehicles through a common interface that exceeded the capabilities of existing connectors at the time. As the first mover in EV manufacturing, Tesla faced a competitive landscape where other automakers at the time were unwilling to put the time or effort necessary into building a common DCFC charging standard. As it has moved quickly to build customer interest and adoption of EVs, Tesla has invested billions of dollars of private capital into building the largest global DCFC charging network to support its customers. This investment continues to grow, and the network has roughly doubled in size over the past two years.[94] Given Tesla's significant percentage of Californian EV sales,[95] the Tesla Supercharger network is by far the most ubiquitous DCFC network and arguably the most reliable,[96] and has the highest customer satisfaction in the industry.[97] Despite this infrastructure innovation and investment, CARB's proposal now seeks to place a significant cost burden on Tesla that will not be shouldered by other manufacturers. As proposed §1962.3 is discriminatory, penalizes innovation, raises electric vehicle prices, and has no substantive record justification.

1. Existing Vehicle DCFC Use Cases Do Not Warrant the Requirement

A majority of electric vehicle charging occurs where the vehicle is parked for many hours at a time, typically at home or at the workplace.[98] Most Tesla drivers use DCFC infrequently, if at all, and fast charging is typically used

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[93] See CARB Appendix F-4 at 8.
[94] See, Tesla, Supercharger. Over the past four quarters, Tesla has opened 7,463 Supercharging stalls at 785 new Supercharger locations around the world, an average of more than two new locations every day.
[95] InsideEVs, California: Plug-In Car Sales Up 79% In 2021, Tesla Model Y #2 Overall (Feb. 9, 2022); California New Car Dealers Association, California Auto Outlook, Vol. 18, No. 1 (Feb. 2022).
[96] Tesla, Impact Report 2020, at 36 (The chances of not being able to charge at any location at any given time are close to zero.).
[97] JD Power, Public Charging Experience for Electric Vehicle Owners Can Get Much Better (August 18, 2021).
[98] See e.g., NREL, Electric Vehicle Charging Implications for Utility Ratemaking in Colorado, at 10 ("At present, the tendency is for more than 80% of EV charging load (and as much as 93% under some scenarios) to happen at home, mostly in the evening. The rest is divided between public charging and workplace charging."); See also, McKinsey, Charging Ahead: Electric-vehicle infrastructure demand (Aug. 8, 2018) ("While most chargers—over 95 percent—will be in homes and

for long-distance travel needs. An EV driver's DCFC usage will vary depending on the driver's typical driving patterns, location, and access to home and workplace charging. CARB should consider the variation in Tesla driver charging needs and not assume a one-size, fits-all approach is appropriate or the costs of such an approach justified for the reason.

Today, there is no single DCFC connector that can serve all EVs in the U.S. There are currently three DCFC connectors utilized in North America: the combined charging system (CCS1), Tesla, and CHAdeMO, however, the CHAdeMO standard is being phased out in North America. The Tesla connector and CCS1 are the predominant connector types in the U.S. While the Tesla connector is currently only used by Tesla vehicles, Tesla vehicles make up about two-thirds of the DCFC-capable EV sales in the US since 2014. About 60% of the DCFC stations currently deployed in California use Tesla connectors, called Tesla Superchargers.[99] When Tesla began developing the Supercharger network in 2012, the only publicly available DCFC connector was the CHAdeMO connector which was capable of charge rates up to 50 kW, which is inadequate for larger battery sizes and the charging time required to transition most drivers from internal combustion vehicles to EVs. The development of the Supercharger network and Tesla connector pre-date the CCS1 connector standard. Charging capabilities and station access are critical to supporting EV adoption, and as a result, Tesla developed Superchargers and a connector capable of higher power DC charge rates that is also capable of providing alternating current charging through the same connector interface.

For several years, Tesla offered a CHAdeMO adapter for sale to our customers, yet fewer than 2.5% of Tesla vehicle customers in North America have purchased the adapter, and those that have purchased it rarely use it. Less than 0.2% of electricity that goes into Tesla vehicles in North America comes from CHAdeMO stations, despite the presence of more than 4,600 CHAdeMO locations. The ubiquity of Tesla Supercharger stations, larger stations with high power capability, and a focus on a seamless customer experience, explain the low uptake of the CHAdeMO adapter for Tesla vehicles. The Supercharger network has approximately 1,600 locations with over 16,400 fast charging stalls across North America. The Supercharger Network delivers more than 99.3% of all fast-charging kWh for Tesla Model 3 and Model Y vehicles in the U.S. Compared to Tesla Superchargers, which are generally 150 – 250 kW, CHAdeMO stations are mostly 50 kW chargers, which result in a significantly longer charge time for EV drivers.

Further, while Tesla Supercharger stations have an average of 10 DCFC ports per station, both CHAdeMO and CCS1 stations have an average of about 2 DCFC stalls per location, which can result in long queues to charge during peak charging times, or availability challenges due to a lack of equipment redundancy if stalls are broken. In addition, Tesla's focus on a seamless customer charging experience from identifying the charging location, plugging in to charge, and automatic session payment, are key to transitioning internal combustion engine drivers to electric vehicles and keeping them there. In sum, the use case for requiring Tesla to provide a CCS1 adapter with each Tesla vehicle is virtually non-existent due to the ubiquity of Tesla charging options and would result in costly and unutilized charging equipment from prospective Tesla owners. Simply put, CARB's proposal would mandate that Tesla, at significant per vehicle cost, provide an adapter that will go unused by all but a few vehicle owners. Allowing for a customer point of sale opt out would reduce the purchase price of the vehicle I the amount of the adapter and prevent the distribution of unneeded adapters that will go to waste.

2. Allowing Manufacturers to Make Adapters and Charging Cords Available at Retail Are Reasonable Alternatives

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workplaces from a charger-count perspective, the share of capital investment they represent is closer to roughly 70 percent of the total. This reflects the significantly higher cost of faster chargers.")

[99] Department of Energy, Alternative Fuels Data Center Station Locator.

In proposing regulations, CARB is required to consider "reasonable alternatives . . . that are proposed as less burdensome and equally effective in achieving the purposes of the regulation. . ."[100] CARB's proposed mandate of the use of a specific charging technology and connector should be eliminated and replaced with a reasonable alternative that is less costly and more effective.

Tesla requests that CARB amend the proposed regulation to allow compliance through a manufacturer offering a CCS1 adapter for sale to its customers as an optional accessory or that CARB re-evaluate the proposed MY 2026 CCS1 requirement in 2024 to determine whether it is a necessary component of achieving ACC II's proposed annual ZEV targets. Additional time will enable CARB to assess customer up-take and use of optional adapters, as well as the continued build-out of Superchargers and third-party DCFC capable of serving Tesla vehicles. This is a reasonable, less burdensome alternative that would yield the same or similar benefits as the staff proposal and do so without mandating new costs onto the hood of an EV sale. It would also provide customers with the option to use other DCFC stations and allow other charging developers to increase station utilization and charging revenue.[101] Tesla has developed a CCS1 adapter that is currently being tested in South Korea and plans to release the CCS1 adapter for purchase in North America.[102]

In contrast, the current draft proposal would impose excessive costs on Tesla (and Tesla alone) and, most importantly, on our customers with little benefit since we expect few customers will get significant use of the CCS1 adapter. Tesla expects home and workplace charging using Level 2 alternating current to remain the overwhelming majority of the charging requirements for EVs. The price of the CCS1 adapter in North America has not been publicly announced at the time of these comments, however assuming Tesla makes available to the public a CCS1 adapter for $400 (the same price as a CHAdeMO adapter), and assuming static new Tesla sales in California at 2021 levels of about 121,000,[103] the cost of CARB's proposed requirement §1962.3(C) would be $48.4 million a year. This cost per CCS1 adapter would be incorporated into the total cost of each new Tesla vehicle, regardless of if the driver intends to use a CCS1 station to fast charge or not. Accordingly, another option is to allow the customer to opt-out of the adapter at the point of sale and reduce the final sale price by the retail value of the adapter. Further, the cost of a CCS1 adapter is more appropriately borne by charging developers or host customers that wish to attract Tesla drivers to their stations. The initial investment in the CCS1 adapter by charging developers will quickly be offset by the increase in charging revenue.

Additionally, while CARB has recognized Tesla's industry leading mobile connector cord,[104] Tesla increasingly finds that utilization of the provided mobile connector cord drops with increased EV penetration and public, home, and workplace charging options. BEV owners in multi-unit dwellings often do not have access to a plug for their mobile connector and seek alternative charging solutions like local Tesla Superchargers and Level 2 destination charging locations. Households owning multiple Tesla vehicle often find the mobile connector cord in the second vehicle redundant. Accordingly, Tesla requests that CARB also amend proposed §1962.3(c) to allow customers to reduce their vehicle purchase price through a point of sale opt-out of the charging cord. Doing so will further reduce the cost of BEVs and reduce electronic waste.

3. Future Accessibility to the Tesla Supercharger Network

In contrast to mandating a CCS1 inlet in a Tesla vehicle or provision of a CCS1 adapter with every vehicle that will rarely, if ever, be used by Tesla vehicles, Tesla is already taking steps to open its DCFC infrastructure to non-

[100] CA Government Code, §11346.2 (b)(4).
[101] See EVgo, Fast Charge Your Tesla Model S/3/X/Y with EVgo (Non-Tesla charging developers like EVgo have installed Tesla connectors in order to increase utilization of their U.S. charging stations).
[102] Electrek, Tesla launches CCS adapter in Korea, confirms coming to North America 'soon' (Oct. 19, 2021)
[103] California New Car Dealers Association. California Auto Outlook, Vol.18, No. 1, at 5.
[104] ISOR at 51.

Tesla electric vehicle owners. To facilitate CARB's goal of supporting greater EV deployment across the vehicle fleet, CARB should instead focus on supporting efforts to provide greater access to DCFC charging infrastructure via the infrastructure side of the equation rather than on the vehicle side, especially for non-Tesla electric vehicles. This infrastructure development work can be done in partnership with other state agencies that area dedicated to supporting its build out including the California Energy Commission and the California Public Utilities Commission.

While Superchargers are currently only compatible with Tesla vehicles, Tesla does not view the Supercharger network as a "walled garden," and has discussed opening the network with other OEMs, however these conversations have yet to be conclusive.[105] In November 2021, Tesla began a program to allow non-Tesla owners to utilize the Supercharger at selected sites in several countries.[106] At present, there are approximately 200 Supercharger locations across Europe in Austria, Belgium, France, the Netherlands, Norway, Spain, Sweden, and the United Kingdom that are open to non-Tesla vehicles. As a result, Tesla is currently the largest operator of public charging stations capable of more than 150kW in Europe. It is Tesla's intent to open Supercharger locations globally to non-Tesla vehicles over time and we expect that to occur in California well before MY 2026.

4. Appendix A-6, Draft Amendment: § 1962.5 Data Standardization Requirements for 2026 and Subsequent Model Year Light-Duty Zero Emission Vehicles

A. Diagnostic Connector – Proposed § 1962.5 (c)(2)

CARB proposes an update to communication protocols and data access for BEVs that would require a standardized J 1962 connector that is compatible with automotive scan tools.[107] The agency should ensure that any such requirement is future-proofed and inclusive of new technologies that can provide service repair information in easier and more cost-effective ways.

In BEVs OBD-CAN is archaic and it should not be the only way manufacturers can be compliant. CARB should allow for additional connector options. Previously, CARB has taken such an approach in its standards for new heavy-duty zero-emission powertrains.[108] Those CARBs standards allow manufacturers to choose how to best provide relevant diagnostic information to the vehicle operator. This ensures that vehicle purchasers and operators will have the necessary operating information for repairability while maintaining product design flexibility and more optimal customer experience, which is critical to driving product innovation and adoption.[109] More specifically, Tesla strongly supports CARB providing the flexibility to utilize diagnostic over IP (DoIP) capabilities.[110] Allowing for DoIP communication supports future designs and will promote greater access to diagnostic information. DoIP would support wireless diagnosis and is a more future-proof solution to communicate onboard diagnostic data, software updates, and vehicle data. Tesla vehicle advances such as software updates need higher data throughput (software updates, drivers assistance, navigation maps, large software games, etc.).

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[105] See, Tesla, Tesla, Inc. Q1 2018 Financial Results and Q&A Webcast (May 2, 2018) (Tesla publicly indicating that it is open to other automakers utilizing the Tesla connector).
[106] See, Tesla, Non-Tesla Supercharger Pilot
[107] Proposed §1962.5 (c)(2).
[108] California Air Resources Board, California Standards and Test Procedures for New 2021 And Subsequent Model Heavy-Duty Zero-Emission Powertrains (June 27, 2019) at §C.3.1. ("A manufacturer must have installed a connector meeting the requirements in subsection (h)(2) of title 13, CCR, section 1971.1, with a vehicle controller area network communications protocol that is capable of connection and communication with scan tools that meet the requirements in subsection (h)(3) of title 13, CCR, section 1971.1 ***or have a device permanently installed on the vehicle capable of displaying the information required in section 3.2 without the need for additional diagnostic tools.***")(emphasis added).
[109] See, Tesla Comments to CARB (Feb 15, 2019). Tesla incorporates by reference these comments.
[110] Proposed §1962.5(c)(3)(B).

To that end, Tesla recommends CARB ensure that other devices can be installed in a BEV, including, but not limited to, a RJ45 connector[111] or wireless connection option. Specifically, RJ45 cables are ubiquitous, reduce costs for technicians and facilitate greater standardization. Many components within a Tesla vehicle, and increasingly other OEMs, do not necessarily communicate over CAN. Newer technology and autonomous driving features have high data throughput needs (for example, camera images or transferring a 4-dimensional rendering of the environment around the vehicle during the process of troubleshooting) that are not compatible with the CAN system. Allowing for RJ45, wireless, and other manners of connection will permit proper and fulsome communication of such data.

B. Battery State of Health – [Proposed §1962.5(c)(6) and §1962.5(c)(4)]

In establishing the battery State of Health (SOH) requirements at proposed §1962.4(e)(4), Tesla recognizes that CARB's goal is to provide consumers with transparent information on battery aging to secure greater consumer acceptance and uptake of EVs. Accordingly, any regulation that establishes consumer access to battery SOH information should be accurate, reliable, and understandable.

Tesla believes that CARB's draft regulations do not utilize the best and most reliable metric and methods for providing accurate battery SOH to the consumer. Using a battery SOH — estimated onboard by either capacity or usable battery energy (UBE) --as a diagnostic tool or warranty repair trigger is fundamentally and technically inappropriate and impractical, will likely lead to perverse outcomes/gaming, will increase the cost of EVs, and undermine the goal of increasing EV penetration in lower-income communities.
As a superior alternative, and as described below, Tesla proposes that CARB amend the regulation to provide a SOH metric utilizing an easily accessible, on demand off-board capacity test.

(1). Measuring Battery Capacity More Accurate

As proposed, §1962.5 (c)(4)(A)(c) established SOH as a function of useable battery energy (UBE). This fails to use the best available and most accurate measurement assessing the impacts of battery aging. Battery capacity retention is a much more accurate measurement. Battery capacity is a fundamental characteristic of a battery pack and measures the total amount of electric charge that can be delivered by a battery pack going from full to empty and is not sensitive to testing conditions like load profile or temperature. As a result, battery capacity can be accurately measured by draining the battery and recharging it to full capacity.

Unlike capacity, UBE is not an inherent characteristic of a battery pack and has variability based on factors such as the temperature of the cells, discharge load, and the aging of battery cells. As a result, any given UBE reading will be variable and depend on test conditions like temperature, driving behavior, auxiliary usages, and driving mode. Traditional measurement of UBE requires a dynamometer and follows precise test protocols and, as such, estimates are difficult to verify and can only be done via a complex range test. All these factors reduce the transparency and add unnecessary uncertainty to any SOH estimate provided to a consumer.

(2). On-Board SOH Diagnostics Can Be Significantly Flawed

Proposed §1962.5(c)(6)(A) would also require that SOH data be displayable to consumers in the vehicle at any given time without the use of a diagnostic scan tool and that the accuracy of such reports, via proposed §1962.5(c)(4)(c), not deviate more than 5 percent higher than the measured usable battery energy. CARB should fundamentally amend this proposed regulation.

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[111] Tesla notes that an RJ45 ethernet jack is commonly available. Compatible cables are even more readily available than those conforming to SAE J1962. Further, the ethernet protocol is a commonly available across a broad array of industries and is non-proprietary.

Onboard measurements during vehicle operation in-field provide weak observability, are highly dependent on customer usage patterns, and provide poor accuracy for measuring both UBE and capacity retention. As noted above, the variability in conditions impacting UBE means that, with an on-board monitor the metric can only be estimated, and the estimation models are easily gamed by any OEMs to achieve compliance. Instead of providing better consumer transparency this requirement can lead to confusion and misinterpretation that impact consumer's decisions and, moreover, provide an untrustworthy solution for conveying consumer information in the used EV market.

Further, if the mandated reported SOH value is the outcome of a continuous estimation (and not calibration measurements), the estimated SOH value will go through various filters and battery management system (BMS) estimation algorithms. These "black box algorithms" can heavily rely on pre-defined SOH degradation models. This creates a risk that such a pre-defined SOH degradation model could be ill-designed to not drop below a defined durability requirement breakpoint (e.g., saturate SOH at 80% until 8 years). Most certainly, CARB should avoid requiring, and having consumers relying upon, any such type of diagnostic tool open to such gaming.[112] Similarly, real time capacity retention measurement also suffers from inaccuracy. EVs rarely, if ever, perform full charge/discharge cycles during use. Further, accuracy of the measurements depends on the current usage of the packs and cell chemistry. This can skew apparent SOH retention with significant artifacts (e.g., a chemistry with better retention and lower cost can appear to degrade faster than other chemistries.). **[**Confidential Business Information [redacted].**]**
In sum, whether SOH is measured by UBE or capacity requiring a real-time, always-on disclosure to a customer means OEMs must estimate (instead of measure) this metric using pre-defined, proprietary models or algorithms, which can be manipulated and very difficult for regulators to understand or verify. Different cell chemistries, cycling patterns, and cell aging can complicate and introduce distinct bias, in either direction, to these algorithms. As a result, Tesla does not believe any OEM, including Tesla, can utilize on-board measurements to reliably (within +5%) estimate SOH, whether defined by UBE or capacity. This requirement would be problematic for providing customers accurate data and creates a potential for consumer misunderstanding and inappropriate reliance on such data. Further, given these limits, any consumer-facing, onboard SOH monitor creates the very problematic potential for warranty claims to be triggered by an estimate of SOH that utilizes hard to verify proprietary algorithms and not by actual measurement.

(3). Tesla Proposal for Readily Accessible Consumer Capacity Testing

CARB should refocus its draft regulation on ensuring accuracy, reliability, and transparency instead of accessibility to a flawed on-board SOH metric. Battery capacity can be directly and accurately measured with a full discharge/charge: not a typical use-case for EVs. Further, capacity retention is a trusted SOH metric for the second-hand market that keeps working even after end of warranty or any regulatory period.

Accordingly, CARB should amend its regulations to provide for an accessible "offboard" capacity measurement that utilizes a full discharge cycle. With this diagnostic system accessed through the vehicle's user interface, a user can request a test that provides a SOH update by automatically running a standalone capacity check that the vehicle can perform on its own overnight. This allows better accuracy, full transparency, and makes the accuracy of the SOH metric easily auditable by third parties. Customers would be able to access the most recent

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[112] See, e.g. Washington Post, Why Carmaker Cheating Probes Stay in High Gear: QuickTake Q&A (Jan. 10, 2018); Bloomberg, Why Much of the Car Industry Is Under Scrutiny for Cheating (Jan. 10, 2018); Quartz, It's not just Volkswagen. Every diesel car company is emitting more pollution than tests show (May 18, 2017)

result of a valid SOH measurement / calculation along with date or mileage at which the SOH measurement was taken. It will also ensure clear warranty conditions where any customer can run an overnight onboard test and make a warranty claim based on the measured (not estimated) results of the test.

Additionally, Tesla plans to further enhance its SOH system. It would constantly monitor the vehicle's behavior and if a customer were to inadvertently rest at a low State of Charge (SOC), charge the vehicle to a high SOC and rest there again. In addition, the SOH would automatically be updated without the customer having to trigger a SOH test and wait overnight. Each time the vehicle is passively used in such a way that meets the criteria for this type of SOH update, the data, Odometer reading, and results would also be posted to the customer/technician accessible running log of SOH history. CARB's regulatory structure should encourage this kind of innovation and flexibility.

4. Appendix A-7, Draft: [1962.6 Battery Labeling Requirements](#).

As proposed at §1962.6, Tesla finds the requirement reasonable. The regulation will require OEMs to provide additional information, some of which seems unnecessary. For example, given the variance in cell form factors, proposed §1962.6(b)(C) requiring the count of individual cells does not appear to have any specific utility and could be revisited.

Tesla also requests that CARB amend proposed §1962.6(c)(2(J) to allow the data repository website to utilize web-based contact forms[113] in lieu of specific e-mail addresses or phone numbers. This standard form of website-based support communication allows for more efficient tracking and servicing of inquiries.

5. Appendix A-9, Draft Amendment: §1962.8 Warranty Requirements for Zero Emission Vehicles and for Batteries in Plug-in Hybrid Electric Vehicles for 2026 and Subsequent Model Year Passenger Cars and Light-Duty Trucks.

A. Proposed Warranty Requirements

Under proposed §1962.8(c)(3), manufacturers would be required to warrant that a battery is free from defects in materials and workmanship which cause the deterioration of the battery state of health to less than 70% for eight years or 100,000 miles, whichever occurs first, for MY 2026 through 2030. The requirement would bump up to 75% for MY 2031 and beyond.[114]

Tesla supports a minimum warranty requirement as it may eliminate low-lifetime battery pack designs and deployment. Tesla supports CARB's proposal and notes that the MY 2026-2030, requirements are consistent with the industry norm. If CARB choose to exceed the current industry standard, most, if not all, OEMs would be unable to avoid significant warranty costs and liability without significant additional costs to each vehicle. These additional warranty costs will be passed on to customers and increase EV cost, again dampening EV uptake. Currently, Tesla warrants a Model 3 real-wheel drive vehicle for 8 years or 100,000 miles, whichever comes first, with minimum 70% retention of battery capacity over the warranty period.[115] As noted, most other OEMs offer

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[113] See e.g., Tesla, Contact
[114] Proposed §1962.8(c)(3).
[115] Tesla, New Vehicle Limited Warranty

similar warranty coverage.[116] The proposed warranty requirement escalating liability to 75% of the state of health of the battery pack in 2031 will be a consequential requirement and likely add significant costs. [Confidential Business Information [redacted].] Battery pack replacement is much more expensive than ICE replacement of an emissions control system or transmission. For example, estimates place battery pack replacement and labor in the range from a high end of around $16,000[117] to $5,500.[118] Regardless, if 35% of vehicles were to fail warranty, it represents an average added cost of between $5,600 and $1,925 per car. These figures also do not take into consideration the significant new investment manufacturers will need to make in remanufacturing facilities that seek to repurpose the exchanged battery packs.

Tesla advocates allowing OEMs to determine warranty thresholds as market competition will encourage better and better warranties. Nonetheless, CARBs proposal requiring the now industry-standard 8 year, 100,000 miles with 70% capacity retention for MY 2026-2030 is a step in the right direction. Tesla further notes that CARB can also revisit the MY 2031 increase to 75% as the ACC II program is implemented. Battery technology and capacity retention may improve, and Tesla is actively pursuing ways to improve lifetime capacity while also decreasing cost, increasing range and, fast charge performance- attributes necessary for the widescale adoption of EVs.[119] However, estimating the trajectories of this research and development and technological breakthroughs and deployment more than five years out – especially given looming supply chain challenges of various battery components – is extremely difficult and should not serve as a basis for an overly prescriptive warranty requirement.

6. **Appendix A-10, Draft Amendment: § 1969. Motor Vehicle Service Information - 1994 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Engines and Vehicles, and 2007 and Subsequent Model Heavy-Duty Engines.**

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[116] See e.g., 2022 Ford F-150 Lightning, What is the warranty on the F-150 Lightning? ("Eight years or 100,000 miles (whichever occurs first), with retention of 70% or more of the original High Voltage Battery capacity over that period"); 2022 Ford Mach-E (" Battery is covered for 8 years or 100,000 ;miles, whichever comes first, retaining a minimum of 70% of its original capacity over that period."); Chevrolet, Living Electric: A simple smart way to drive ("Certain electric propulsion components for Bolt EV and Bolt EUV are covered for 8 years or 100,000 miles*"); Volkswagen, The all-new 2021 Volkswagen ID.4 electric SUV ("The high-voltage battery is warranted for eight years or 100,000 miles, whichever occurs first, for defects in material and workmanship and for net capacity loss below 70%, and can also be transferred to a subsequent owner throughout the remainder of its duration."); Audi, E-tron "(8 year/100K miles (whichever occurs first) high-voltage battery limited warranty coverage on MY21 Audi e-tron vehicles. Battery capacity decreases with time and use. Warranty coverage may not return battery capacity to an "as new" condition with 100% net capacity. See owner's literature or dealer for limited warranty details."); See generally, MyEV.com, Evaluating Electric Vehicle Warranties (last visited Feb. 9, 2022). U.S. Department of Energy, Fact #913: February 22, 2016 The Most Common Warranty for Plug-In Vehicle Batteries is 8 Years/100,000 Miles (Feb. 22, 2016).

[117] See, Recurrent, Costs of Electric Car Battery Replacement

[118] Consumer Report, Pay Less for Vehicle Maintenance with an EV (Sept. 26, 2020).

[119] Tesla also continues to make significant investments in advancing EV, solar, and battery storage technology with over $1.1B dedicated to research and development in 2021 alone. See Tesla, SEC Form 10-K (Jan. 26, 2022) at 39; See also, InsideEVs, Tesla Spends Least On Ads, Most On R&D: Report (Mar. 25, 2022)(reporting that Tesla spends $2,984 per car on R&D and that such spending is three times the industry average and higher than Chrysler, Ford, and GM's R&D budgets combined).

Tesla seeks to ensure that customers and auto service professionals can access the information needed to repair Tesla vehicles. Tesla already makes vehicle generated data available to owners.[120] Further, Tesla makes repair and maintenance information, as well as diagnostic software tools, available to third parties for free.[121]

A. Background on Tesla's Approach to Vehicle Level Software Updates

Tesla vehicles do not utilize a PC coupled with vehicle communication interface (VCI) for the purpose of updating individual control units via [SAE] J2534. All software updates are executed at a vehicle package level by the "Updater System" that resides on a central vehicle controller. It is not possible to update individual control units outside of the vehicle package level. When new vehicle packages are available for any given vehicle, they are transferred over the air directly to the vehicle.

Upon electronic control unit (ECU) replacement, it is possible for independent operators to initiate a software reinstallation of the global vehicle level software package already installed on the vehicle to update the recently fitted ECU to be compatible with the vehicle package. It is also possible for independent operators to download and install new vehicle packages as they are made available over the air by Tesla. The download is done directly to the vehicle with no intermediary PC or other device required.

Through the above mechanisms, Tesla is meeting the need in required markets for an independent operator to do repairs like replace a bad ECU and be able to initialize and program the ECU for use in that car, or to update a particular ECU (via a global vehicle level software package) to a newer version outside of the context of a replacement. And Tesla can do so without involving a dealer/authorized OEM workshop.

Accordingly, CARB needs to ensure the following key aspects of newer, developing technologies in BEVs are accommodated under proposed § 1969:

1. A monolithic vehicle level software package framework as compared with individual ECU level updates;
2. Supporting where the act of flashing a controller is not performed across an external interface, but rather internal to the vehicle itself. The external interface is only used in the process of transferring the software package to the vehicle; *and*
3. A vehicle level or ECU level software update framework where the files used to update might not digitally pass through the hands of the repair technician but instead are directly transferred from the manufacturer to the vehicle.

As noted, Tesla does not make emission-related or propulsion-related data available by a SAE 2534-1 based diagnostic or reprogramming tool. Per §1969(d)(10), a Tesla vehicle has no emission-related motor vehicle or engine parts. In contrast, consistent with proposed §1969 (g) Tesla does make propulsion-related data available through other methods, including through an ethernet connection from a laptop with a diagnostic subscription. Tesla accommodates third party servicing of its propulsion-related parts in its vehicles with OEM supplied parts and a vehicle software architecture that allows third-party service to reprogram the ECU and update the new part's integration into the monolithic vehicle level software via an internal vehicle interface. Under CARB proposed §1969(j), however, manufacturers with monolithic vehicle level software packages may not be accommodated. Consistent with the definition of "access code" at §1969 (d)(1), the requirements contained in §1969(j) should remain applicable only to emissions-related engine parts as it is essential to ensure that encrypted ECUs in emission-control devices are not programmed in a manner to evade required pollution

[120] See Tesla, Obtain a Copy of the Data Associated with Your Tesla Account
[121] See Tesla, Service Subscriptions; See also, Inside EVs, Tesla's Service Manuals Now Free of Charge, Grab Them While You Can (May 20, 2022).

controls, as in the Dieselgate scandal.[122] While propulsion parts, like all aspects of a BEV, displace ICE vehicles and their emissions, the function of the parts themselves do not impact the amount or type of tailpipe emissions.[123] Excluding propulsion-related parts creates no scenario where a BEV emissions would be altered and would ensure manufacturers can maintain the benefits of monolithic software package.

IV. Conclusion

Tesla believes the pace of electric vehicle innovation, cost-reduction, and deployment coupled with the public health and welfare imperatives to address criteria air pollution and accelerating impacts of climate change support an increase in overall stringency of the ACC II proposal. Accordingly, Tesla believes the proposal should be amended to achieve and overall stringency level of 100% ZEVs by 2030.

For the reasons set forth above, described herein, and to take additional steps toward increasing the ACC II's stringency and to provide faster and greater deployment of ZEVs, CARB should make the following changes:

Amending the Crediting Flexibilities

- Adjust the historical credit conversion ratio for PHEVs and cap annual historical credit use separately at cap of 10% for BEVs and 5% for PHEVs;
- Substantially adjust the PHEV credit flexibility by lowering the annual cap on the use of PHEV credits to a maximum of 15% annually and eliminating the use of such credits starting in Model Year 2031;
- Raise the overall model year ZEV requirement commensurate with the amount of stringency reduction created by the implementation of the environmental justice credit flexibility programs; *and*
- Allow only BEVs to generate credits under the early compliance credit program.

Amending the ZEV Assurance Measures

- Raise the proposed minimum range for qualifying BEVs;
- Eliminate or reduce the battery durability requirements;
- Provide greater definition on the scope of the durability testing groups; and
- Allow manufacture to provide for an accessible "offboard" battery state of health capacity measurement that utilizes a full discharge cycle; *and*
- Allowing manufacturers to determine warranty threshold as market competition will encourage better and better warranties.

Amending the Charging Requirements

- Allow manufacturers to comply with the standards by providing adapters and charging cords for sale and having point of sale customer opt-out for the purchase of adapters and charging cords.

Amend the Data Standardization and Servicing

- Ensure the standards provide for RJ45, wireless, and other manners of connection that will allow for proper and fulsome communication of increasing high data throughput needs; *and*
- Accommodates manufacturers with monolithic vehicle level software packages.

Tesla believes these changes, and other contained in these comments, will significantly reduce emissions, result in increased deployment of the best available emissions reduction technology (ZEVs), provide consumers greater

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[122] See generally, Washington Post, [Why Carmaker Cheating Probes Stay in High Gear: QuickTake Q&A] (Jan. 10, 2018); Bloomberg, [Why Much of the Car Industry Is Under Scrutiny for Cheating] (Jan. 10, 2018); Quartz, [It's not just Volkswagen. Every diesel car company is emitting more pollution than tests show] (May 18, 2017).
[123] See, [Appendix F-11 Section 1969 Purpose and Rationale] at 4.

access to high-quality, affordable ZEVs, maintain U.S. manufacturing leadership in BEV technology, and ensure that California meets it statutory mandates to protect the public health and welfare from the significant and accelerating impacts from air pollution and climate change.

Respectfully submitted,

Joseph Mendelson III

Attach.
Tesla, Impact Report 2021 (May 2022).