Public Hearing to Consider Advanced Clean Cars II Regulations

Final Statement of Reasons for Rulemaking, Including Summary of Comments and Agency Response

Appendix D
Summary of Comments to ZEV Assurance Measures and Agency Response

Public Hearing Date: August 25, 2022
Agenda Item No.: 22-10-1

Table of Contents

Summary of Comments to ZEV Assurance Measures and Agency Response

As noted in the main body of the Final Statement of Reasons (FSOR), the California Air Resources Board (CARB or the Board) has summarized and responded to written and oral comments on the ACC II regulations and the process by which they were adopted. These comment summaries and responses are contained in multiple appendices to the FSOR, sorted by subject matter. This appendix contains the summaries of and responses to comments related to the ACC II regulations overall, including the ACC II analyses, alternative regulatory structures, and legal authority.

The following notes about the comments and responses will help with understanding how the comments are structured and labeled:

- Each comment has a unique code, as identified in Tables 1-7 of the FSOR. Each code indicates the comment period or context of the submission, followed by a unique number for each comment submitted within that comment period or context. For example, comment "OP-1" indicates a comment received during the original (45-day) comment period ("OP" standing for "original period"), and 1 is the unique number identifying the specific comment. Certain lengthy or complex comments have been given additional code information identifying sections of the comment. For example, comment OP-155-1 would indicate a comment received during the original (45-day) comment period, unique comment identifier 155, and the first substantive portion of the comment. These additional sub-comment codes are shown in the copies of the comments included in the rulemaking file.
- Comments are grouped thematically by section and subsection. Repetitive comments are listed under the same comment number and responded to holistically. Each individual comment excerpt is preceded by "Comment:" and followed by its comment identification code, allowing readers to distinguish among repetitive individual comment excerpts that are bundled under the same comment number.
- Comments are excerpted verbatim unless otherwise noted. In some instances, comment excerpts are preceded by the statement, "Commenter says," with the comment excerpt in quotation marks. In other instances, the verbatim excerpt is presented without any preface or quotation marks. Comments that have been summarized, rather than quoted, are indicated by a preface such as "Commenter says that . . ." and are not followed by quotation marks.
- In verbatim comment excerpts, CARB has not corrected or noted errors in the original (for example, by adding "[sic]"). Comment excerpts' formatting may differ from the formatting of the original comment.
- Footnotes in comments generally have been omitted, though the footnote numbers may remain in the text of the comment excerpt.
- In general, CARB has noted where it made changes in response to the comment. Where it is not noted, no changes were made in response to the comment.

A. ZEV Assurance Measures

1. Comment: CARB received support for its proposal for battery warranty, state of health, and durability requirements, and the ZEV assurance measures as presented in the Initial Statement of Reasons. [T1-35, T1-24, OP-85, OP-172, OP-99, OP-108, OP-148, OP-166, T2-40, T2-44]

   Comment: As more EVs enter the secondary market in the coming years, it is imperative that consumers have protections against poorly designed or manufactured batteries that diminish in capacity or fail early. Our most vulnerable populations at the forefront of climate and air quality hazards deserve consumer protections addressing the lifetime of the vehicle, its battery, and its reparability. [OP-108]

   Comment: The battery labeling and state-of-health requirements proposed in these regulations are also vital pieces that will not only help to improve drive confidence in ZEVs but help increase and facilitate secondary use of batteries after their useful vehicle battery life. [OP-99]

   Comment: Rivian supports the proposed battery warranty for 70% state-of-health (SOH) through 2030 MY and 75% in 2031 and subsequent model years. Transparency about battery capability is vital to both EV penetration and a robust used-ZEV market. We agree with staff that tying the warranty to a meaningful metric best enables consumers to make the switch to electric vehicles with confidence that the technology will meet their needs. Rivian's new vehicle warranty coverage currently includes all components inside the high-voltage battery and 70% or more of the battery capacity for 8 years or 175,000 miles, whichever comes first, which meets the requirement as proposed. We appreciate CARB's consultation with industry in setting the SOH levels, and the appropriate lead time given to meet the increased SOH warranty requirements in 2031 and subsequent model years. [OP-127, B1-10]

   Comment: Commenters support keeping in the proposal consumer protections and right to repair provisions. [T1-35, OP-108]

   Agency Response: CARB appreciates the words of support for the zero-emission vehicle (ZEV) assurance measures adopted in the proposal regarding a minimum battery warranty and durability requirement as well as battery labeling and changes to service information requirements to ensure repair technicians have equivalent access to needed diagnostic and repair information.

2. Comment: Commenter does not believe CARB intended for PHEVs to meet all ZEV assurance requirements including the ones for data standardization and warranty provisions in cases where PHEVs are certified for sale but do not earn credits. Therefore, commenter requests that CARB clarify the applicability for PHEVs in sections 1962.5 and 1962.8. Specifically, in subsection 1962.5(a)(3), commenter suggests deleting the word "all" preceding the word "PHEVs" in the sentence, "The phase-in percentages of subsections (a)(1) and (a)(2) shall be based on the manufacturer's projected sales volumes for all ZEVs and for ~~all~~ PHEVs projected to be certified to earn vehicle values in accordance with title 13, CCR, 1962.4, respectively." In subsection 1962.8(a)(2), commenter suggests replacing the word "also" with the

word "only" and adding the phrase, "to earn vehicle values in accordance with title 13, CCR, 1962.4," in the first sentence. As modified by commenter's suggestions, the sentence would become, "The requirements for a battery warranty in subsection (c) shall only apply to 2026 and subsequent model year plug-in hybrid electric vehicles certified to earn vehicle values in accordance with title 13, CCR, 1962.4 for sale in California". [15-17]

Agency Response: Regarding the applicability of the new requirements for battery warranty and data standardization to plug-in hybrid electric vehicles (PHEV), CARB agree with the commenter that the intent was for such requirements to only apply to those PHEVs certified to earn vehicle values towards a manufacturer's minimum obligation in the ZEV regulation. To ensure others would also correctly interpret the requirements in this manner, staff released changes in the Notice of Public Availability of Modified Text and Availability of Additional Documents and Information Proposed Advanced Clean Cars II Regulations, July 12, 2022, as amended by Errata and Comment Period Extension, July 13, 2022, (collectively, First 15-Day Notice), and have also made non-substantive changes to the applicability sections of the title 13, California Code of Regulations (CCR), sections 1962.5 and 1962.8 to slightly reword the applicability to be more consistent and clear. With this change, this also clarifies the commenter's third point regarding PHEVs for which the new battery warranty requirements do not apply in that such PHEVs will still remain subject to the existing warranty and warranty reporting requirements that apply to all PHEVs today.

3. Comment: 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, 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. 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. [OP-78]

   Comment: 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. [OP-78]

Comment: The existing annual ZEV percentage standards are already challenging and extra requirements such as minimum range, battery durability, and limits on credit flexibility will add unnecessary costs and potentially decrease affordability of ZEVs. [T1-8, T1-11, T1-14]

Agency Response: CARB considered these comments and did not agree with commenters' conclusions regarding the ACC II ZEV assurance measures adding unnecessary additional cost, creating barriers to consumer adoption, and having other potential consequences. As accounted for in this rulemaking and documented in the ISOR and constituent economic analyses, several of the adopted measures will lead to higher costs for manufacturers that are presumed to be passed along to consumers in the form of increased purchase price. However, staff's assessment is that these measures are not just intended to but are necessary to increase the consumer acceptance and likelihood of a successful transition of the light-duty vehicle fleet predominantly to ZEVs. While ZEV sales have steadily increased in California as a larger share of new car buyers are willing to adopt the technology, sales still represent a minority of total sales and even less is known regarding the acceptance of these vehicles to second, third, or fourth owners as they enter the used car market, as discussed on page 70 of the ISOR. In addition to providing consumer confidence and reliability so that ZEVs can fully penetrate both the new and used vehicle markets, these requirements have important distributional equity implications, as they can assure the performance of vehicles bought used and when vehicles are more affordable.

For each element of the newly adopted measures, the need and rationale was identified in the ISOR as to which barriers to adoption the measure was intended to help address or other needs that the action would help satisfy. None of these requirements intended to make it easier and cheaper to charge the vehicle or to put consumers' minds better at ease regarding expected durability of the battery and vehicle, even when accounting for any associated minor increase in costs to manufacturers, could be reasonably expected to have a net negative impact on consumer adoption. For charging-related measures, the total incremental costs are less than 100 dollars, which represents approximately 0.2% of the typical purchase price of a new vehicle yet provides increased certainty as to where the consumer can charge and virtually eliminates the need for a typical consumer to buy a home charger unit for several hundred to a thousand dollars. For the durability requirements, the adopted proposal includes less stringent criteria for the first four model years (MY) that largely aligns with several manufacturers' projections of expected durability on current ZEVs. Of note, this commenter (Tesla) has publicly shown data in its sustainability reports that shows many of its customers are already seeing significantly better durability than what the newly adopted near-term or long-term durability provisions actually require. Given the additional leadtime to further refine battery designs and take advantage of continued advancements in battery chemistry, manufacturing, and in-vehicle thermal management, manufacturers have ample time to shore up any areas where they foresee an unacceptable risk in durability and to do so cost-effectively during normally scheduled battery design updates and revisions.

Further indicating the appropriateness of CARB's approach, ZEV technology has indeed progressed over the course of the existing ZEV regulation, vehicle range has directionally increased to better meet consumer demand, and nearly every manufacturer offers a stated warranty on recent introductions that is fairly consistent and competitive across the industry at, or very close to, the new minimum warranty levels adopted in the ACC II ZEV regulation. However, there is no guarantee that such behavior would continue in the future nor is there any mechanism to hold a manufacturer accountable to any of these policies. In order to better ensure a successful transition to ZEVs and therefore ensure the emission benefits of the regulation, consumers will need to have an increasing level of confidence that ZEVs will be durable, reliable, serviceable, and fully meet their needs and that manufacturers will stand behind the products they sell in a manner equivalent to what they do with current gasoline vehicles.

Additionally, the adopted minimum battery warranty has provisions to anchor the requirement to an objective calculated value that the consumer will have access to and the minimum durability requirements will exceed what today's ZEVs directly offer to consumers by providing a guarantee of maintaining a specified percentage of the original range. Absent adopted requirements for either of these, consumers would be left with a warranty policy that not only could be changed by manufacturers at any time but can only be decided by the manufacturer itself as to whether something qualifies for warranty replacement. Overall, CARB does not agree with the commenter that such a policy provides sufficient assurance to consumers that it would have a high likelihood of meeting the emissions reduction goals of the ACC II regulations.

4. Comment: Commenter encourages CARB, beyond the proposed ZEV assurance measures, to continue to explore performance standards for ZEVs and PHEVs to drive technology innovation for further reductions in their well-to-wheel emissions. Such metrics could incorporate the per kWh upstream CO2 emissions, and miles/kWh vehicle in-use consumption. According to the commenter, this will ensure a continued focus on further efficiency improvements as opposed to power and acceleration which can drive up the overall CO2 footprint of electric vehicles. [B1-1]

   Agency Response: The commenter requests that CARB continue to explore other performance- and technology-enhancing measures, such as the energy efficiency of ZEVs and energy use as a function of emissions from upstream energy production. CARB appreciates the suggestion, and will continue to constantly reevaluate technology development and deployment across all sectors and identify opportunities for further feasible reductions.

5. Comment: To account for uncertainty and variability in the real-world (e.g., frequent vehicle owner full-charge, deep-discharge, and fast-charging events) consider enforcement action only when greater percentage of in-use tested vehicles are below the regulated state-of-charge levels (i.e., as compared with the proposal for greater than 5 of 10 tested vehicles). [OP-98]

   Agency Response: As part of the adopted suite of ZEV assurance requirements, future ZEVs will be required to log data on vehicle regarding the frequency and cumulative

amount of certain activities that are known or suspected to have a larger impact on degradation of today's battery technologies. This vehicle-specific data includes information on the amount of fast-charging, the amount of energy output by the vehicle to the grid or other off-board usage, and the average battery temperatures (while in-use and while parked) that the vehicle has been subjected to. Further, the criteria for excluding vehicles from being used in a test sample to determine compliance with the vehicle durability requirements in title 13, CCR, section 1962.7 explicitly call out these parameters and provide for exclusion of vehicles with excessive usage or quantities in these parameters. In this manner, the enforcement procedures account for expected variation in the real world regarding operation that can have a proportionally higher impact on degradation than typical consumer operation.

Additionally, staff already are and will continue to work with manufacturers through SAE committees and standards development as additional factors of concern are identified with newer battery technologies so similar data transparency can be put in place. It is expected that, during future reviews and potential updates to the ZEV regulations, there will be opportunity to add to or modify these current parameters as industry gains further knowledge on battery or vehicle operating conditions that are known or suspected to exacerbate degradation. For example, the commenter mentions frequent owner full-charge and deep-discharge. Staff has already begin working with SAE on parameters that could adequately capture and quantify that type of behavior to provide meaningful context for identifying vehicles that have been subjected to excessive levels relative to typical vehicles. While such newly developed parameters are not explicitly required or named in the adopted ACC II requirements, manufacturers will still be able to optionally include such parameters. Future reviews and updates would provide for an opportunity to amend the ACC II regulations to add such parameters if CARB and industry believe there is sufficient value and need to track this information.

6. Comment: … we point out that the ACCII ZEV proposals embody a significant new approach to ZEV regulation: Irrespective of whether an OEM wishes to receive ZEV credit for a given model, ALL 2026 and subsequent model year zero-emission vehicles and plug-in hybrid electric vehicles certified for sale in California under 13 CCR 1962.4 must meet certain new substantive ZEV requirements. This means that even though SVMs are not required to meet the minimum fleet ZEV requirements in 13 CCR 1962,4(b) until MY 2035, they still must meet the above new substantive requirements if they wish to certify a ZEV in California. This is a big change, especially for SVMs. Some SVM flexibility is therefore essential….most of the proposed ACCII ZEV proposed rules do not provide sufficient flexibility for SVMS. This is inequitable and inconsistent with established CARB policy on SVMs. Indeed, SVMs do not fully know today the implications of the various new ZEV requirements being proposed, and the implications could be significant, including the potential need to identify new suppliers (particularly as regards battery / vehicle warranties, vehicle charging, and Data Standardization requirements). SVMs, because of their low volume production, often find it challenging to find suppliers, a significant factor contributing to the need for additional lead time. Consistent with the CARB LEV IV proposals, we request that CARB provide extra lead-time for SVMs in the new ZEV rules -- until MY 2030. [OP-56]

Agency Response: Contrary to this commenter's assertions, CARB's approach to requirements for small volume manufacturers (SVM), meaning those that deliver for sale fewer than 4,500 light-duty and medium-duty vehicles in California on average, for the ACC II rules is consistent with other light-duty vehicle regulations. As the commenter noted, a phase-in was created for section 1962.5 data requirements and section 1962.7 alternative sampling plan methods, in addition to ACC II not requiring full compliance with annual ACC II ZEV sales requirements prior to 2035 MY. Similarly, even with conventional vehicles and tailpipe criteria pollutant standards where SVMs may be afforded less stringent emission standards to certify to, there are many requirements such as warranty, vehicle labeling, on-board diagnostics, standardized data, and in-use compliance over the full useful life (i.e., durability) that the manufacturer is accountable for meeting. For ZEVs, these remaining measures are similar in that they are minimum characteristics determined by staff to be necessary to increase the likelihood of a successful transition to a predominantly ZEV fleet. SVMs are still provided the ultimate relief in not having any obligation to supply an increasing share of their sales as ZEVs from 2026 through 2034 but, when they do bring ZEVs to market, those ZEVs must be durable, serviceable, and compatible with charging infrastructure, similar to the ZEVs manufactured by non-SVMs.

7. Comment: Commenter continues to prefer that the battery durability, warranty, and state of health (SOH) requirements be based on useable battery energy (UBE) rather than on range. [15-17]

   Agency Response: For the adopted requirements, battery warranty and battery state of health are indeed required to be correlated to usable battery energy. These requirements exist to identify and protect against degradation of only the battery's ability to store energy. Usable battery energy represents a measurement of how much energy the battery can store and subsequently provide to the vehicle to enable to vehicle to be used (i.e., to be driven). It is a quantity assessed during official testing procedures to quantify range and energy consumption of the vehicle. The adopted requirement for durability, however, is correlated to the all-electric range of the vehicle and exists to protect against degradation of any vehicle powertrain component that can result in a loss of driving range for the vehicle user, not just the battery. For example, malfunctions or degradation in components like the electric drive motors or inverters could cause those components to operate less efficiently and consume more electricity per mile. These kinds of failures or degradations would lead to a reduction in range by using up all of the stored energy from the battery at a faster rate than normal. While many in industry have argued that degradation in the battery's energy storage will be the most likely and dominant mechanism for a reduction in the vehicle range, the durability requirement was purposefully designed to account for any drivetrain component that adversely affects vehicle range and not just the battery. As structured, whether predictions that battery degradation will be the most common mechanism turn out to be true or not are irrelevant, as all mechanisms will be covered.

B. ZEV Durability Requirements and Enforcement

1. Comment: Commenter opposes the ZEV durability requirements. [OP-124, B1-2]

Comment: We do oppose the durability requirements included in the proposed 13 CCR §1962.4 ("ZEV regulations") and implemented in 13 CCR §1962.7 ("ZEV In-Use Requirements"). [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

Comment: The Automakers cannot support the proposed requirement on Battery Durability, which specifies 80% remaining EV range at 10 years or 150,000 miles, nor could we support even a moderately lower threshold, should one be proposed. This requirement exceeds the capability of current battery cell technology implementation, and the range of penalties associated with failure to meet the requirement include recall; a drastic and prohibitively costly remedy. Based on current and publicly disclosed future technology, as well as reasonable assumptions about technological maturation, compliance with the proposed regulation is possible only through the addition of extra, reserve battery capacity to 'simulate' the cell degradation curve desired by the regulation. [OP-148]

Comment: Commenter asks CARB to revisit the durability requirement due to cost burden. [T1-43]

Comment: Commenter supports the intent of the EV battery durability provision, but not as currently written. If the provision implemented is unchanged, the requirement will increase the cost and weight of electric vehicles sold in California with no new vehicle customer benefit. [T1-7]

Comment: We recommend modifying the proposed durability requirements to better meet customer expectations for electric range and vehicle cost. [OP-98]

Comment: Rivian agrees with the in-use durability standards and transparent battery health in principle, but caution that the proposed language will likely force reserve capacity and thereby increase vehicle cost (both new and used), obscure true battery capability, decrease vehicle performance with added weight, and expose manufacturers to cost-prohibitive corrective actions. According to the ISOR, the 80% SOH target reflects CARB's consideration of future innovations to increase durability. In weighing battery product development timelines with the lead time for this durability requirement, Rivian believes an 80% target will force manufacturers to build in reserve capacity in the early years, especially for heavier, more capable, vehicles. [OP-127, B1-10]

Comment: Indeed, CARB should amend the durability 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 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. [OP-78]

Comment: Commenter states that the new durability proposal for battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs) requires at least 80% of original

certified range for 10 years or 150,000 miles, whichever occurs first. The decrease in EV range is due to unavoidable battery degradation (i.e., loss of useable battery energy). We agree with AAI's comments that current commercially available battery technology does not exist to meet the proposed ZEV durability requirements. Without changes to the proposed regulation, manufacturers will be forced to restrict the total battery energy available to customers resulting in reduced range. To maintain the intended range OEMs would need to redesign the vehicle to incorporate more battery capacity. This will result in higher cost, reduced vehicle efficiency due to increased battery weight, and additional stress on limited critical mineral supply. In either case the customer will pay for capability that they will not be able to realize. [OP-95]

Comment: We cannot support the EV Battery Durability provision in its current form. We are aligned on the need to ensure that EVs remain capable and reliable as they age, but regulatory requirements must be compatible with available technology. As currently written, the durability requirement will force manufacturers to add 'reserve' battery capacity, unavailable to the new-vehicle customer. This will result in an increase in cost and weight for the new vehicle customer with no vehicle range benefit. It will result in fewer EVs produced and made available to prospective vehicle buyers, as battery raw materials and the battery supply chain cell production remain constrained. It will also drive vehicle complexity, with EVs for sale in California having less range (at same cost and weight) as identical EVs for sale in other US States. It will limit our ability to fully unlock features that provide Grid resiliency in California and force manufacturers to limit activities such as fast charging and V2X. The overall result of this Battery Durability requirement will be a negative impact to new EV sales, and further limit affordable vehicles to equity communities. [OP-94]

Comment: 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. 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. [OP-78]

Comment: 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, 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. 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, 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. [OP-78]

Comment: Commenter states that 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. This same survey found that long-term considerations like resale value were much lower priorities. 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. Similarly, a recent Pew Research Center study found that: The public's views on electric vehicles at this stage appears clear on two counts. Roughly two-thirds of households (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. 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. [OP-78]

Comment: Tesla questions the legal authority and record basis to implement BEV durability requirements found at proposed §1962.4(d)(2), as well as CARB's reasoning. Indeed, CARB has supported the durability standard by citing one public opinion survey publication that makes no mention of battery durability. Imposing durability requirements on BEVs provides no 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. 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. [15-8]

Agency Response: CARB considered these comments related to concerns regarding ZEV durability requirements and general opposition to the requirements proposed or

the need for such requirements. Overall, the Board directed staff to modify its ISOR proposal related to battery durability, and adopted the regulations it determined are most effective at achieving the statutory goals to feasibly reduce exhaust and evaporative on-board emissions to the maximum extent from the vehicles subject to the ACC II regulations, while imposing the least burdens and impacts on the directly regulated parties and individuals and small businesses in California. These included a modified ZEV durability requirement.

CARB has broad authority to undertake actions necessary to achieve healthful air quality and the required GHG emission reductions. The ACC II regulations establish emission standards and related requirements (including the durability requirement) to ensure the vehicles reliably and consistently meet those standards in a verifiable manner, which manufacturers certify they meet. This mirrors longstanding requirements for conventional gasoline vehicles. CARB has explained how the durability requirement is a necessary component to ACC II, in part to overcome consumer challenges and concerns that present an obstacle to widespread and permanent ZEV adoption, which is necessary to achieve the needed reduction in criteria pollutants, air toxics, and greenhouse gas (GHG) emissions. (*See, e.g.*, Section III.D.2 of the ISOR, Appendix F-5 to the ISOR.) Also, see response to Comment C-14 in FSOR Appendix A regarding CARB's broad authority to regulate vehicle emissions. In this context, a successful transition to a new-vehicle fleet of predominantly zero emissions and well-controlled engines in PHEVs with significant zero-emission capability is a necessary action to meet both the air quality and GHG targets, and the ACC II regulations adopted as part of this rulemaking package all represent individual elements determined to be necessary to support this successful transition. This includes range durability to ensure continued growth in acceptance of ZEVs by new and used vehicle purchasers in California.

As described in the ISOR, the ZEV durability requirement is one of several measures being taken to directionally increase the likelihood of industry as a whole meeting the ACC II regulations, which is necessary to achieve and preserve the intended emissions reductions. Indeed, if the vehicle is unable to maintain sufficient range, it will become unusable to a large portion of vehicle owners and instead of continuing to be operated it will need to be replaced with a more capable vehicle. If such a replacement is an internal combustion engine vehicle, then there will be consequent emissions that otherwise would have been avoided with better durability on the ZEV. Even if such a replacement is another ZEV or a replacement of the battery pack in the original ZEV, there are still consequent emissions from the production of the components of the replacement ZEV or battery pack that occurred unnecessarily earlier than otherwise would have been needed.

As noted in the ISOR, there are several barriers that surveys of vehicle purchasers have identified that are hindering widespread uptake of ZEVs. Concerns and uncertainty over battery reliability and maintenance costs in general are important consumer

barriers identified in research cited,[1,2] even if they may not be the dominant concern in every survey. In addition, two separate Cox Automotive surveys assert that consumers need peace of mind in battery lifespan and replacement, as these fears are top barriers among potential vehicle purchasers that are not considering a ZEV. Cox Automotive reports 42% of such purchasers are concerned about batteries not holding a charge, and 41% are concerned about battery replacement costs.[3] Further, even with 8-year or greater battery warranties offered, 52% of battery electric vehicle (BEV) owners still elect to purchase the extended battery warranty[4]. In a more recent study by Synthesio, more than 14 million online mentions about BEVs were analyzed over a 6-month period and "battery issues" emerged as a major purchase barrier.[5] A durability requirement, in tangent with the other assurance measures, is anticipated to help overcome these barriers and ensure the ZEV requirements of ACC II will be met and the maximum feasible emissions reductions achieved.

With the suite of assurance measures in the newly adopted requirements, directional steps were taken to alleviate every significant barrier identified. While initial cost is also identified as a barrier, absent a durability requirement, manufacturers may be able to achieve even faster and deeper cost reductions at the sacrifice of maintaining or improving durability. However, such an approach is short-sighted and focused only on near-term new vehicle sales without appropriate consideration of the impacts on used car purchasers where the initial cost is a much smaller portion of their automotive expenses when compared to ongoing fueling and maintenance costs. If battery replacement were to become a typically-needed repair for the second or third owner and well within the expected useful life of the vehicle, it would substantially alter the financial picture for a used car purchaser considering a used ZEV or a used gasoline vehicle. Given California's needed emission reductions, a resultant change in used car behavior, such as a preference for gasoline vehicles or holding on to older gasoline vehicles for even longer, would substantially hinder achievement of the needed emission reductions.

While initial ZEV price is often listed as one of the most important barriers, battery and ZEV technology are still developing. Costs are higher than what they will be under longer term, fully learned out, high-volume manufacturing conditions. Purchase price parity is expected to be reached between ZEVs and conventional vehicles in the time of the ACC II regulations. Additionally, ZEV offerings to date have largely been focused on luxury or higher-price market segment vehicles where some of these

---

[1] Bartlett, Jeff. 2022. More Americans Would Buy an Electric Vehicle, and Some Consumers Would Use Low-Carbon Fuels, Survey Shows. Consumer Reports. July 7. Consumer Reports 2022,First 15-Day Notice.

[2] Alison Spencer and Cary Funk, "Electric Vehicles Get Mixed Reception From American Consumers", Pew Research Center, Published June 3, 2021. Pew 2021, Staff Report: Initial Statement of Reasons (released April 12, 2022).

[3] 2021 Cox Automotive Path to EV Adoption Study. Cox 2021a, Staff Report: Initial Statement of Reasons (released April 12, 2022).

[4] Overcoming Electric Vehicle Misconceptions is Crucial to Converting Consideration to Sales (Press release), Published August 19, 2019. Cox 2019, Staff Report: Initial Statement of Reasons (released April 12, 2022).

[5] Emma Huff, "*What Online Consumers Are Saying About Electric Vehicles – And How the 2022 Models Stack up*", Synthesio, Accessed May 23, 2022.

higher costs can be absorbed without as much price sensitivity for the vehicle purchaser. When consumers cite the higher costs of ZEVs, it is reasonable to infer that this is due to this skew in the current luxury ZEV offerings relative to the full market segments with gasoline engine offerings that include mainstream and economy-oriented models and makes.

Costs associated with maintaining or improving ZEV durability were accounted for in the analysis for this rulemaking. Directionally, such costs do result in higher per vehicle costs than is estimated and smaller cost reductions for battery technology projected for the future.

After direction from the Board, the durability requirements were revised for the early years and the ISOR 80% requirement was delayed until the 2030 MY. This provides sufficient lead time for manufacturers to more fully account for the durability requirement in future design choices made at regularly scheduled points in their product cycles. However, the changes provide only a temporary change, with the original requirements still on track for implementation in the 2030 and subsequent MYs. Staff's assessment identified the leaders in industry as likely already on track to meet the adopted requirement with their vehicles, on average, retaining 80% of the original range for 10 years. While manufacturers do not have perfect in-use data of sufficient age and mileage to validate this, their projections for the 50th percentile user would put them on a trajectory that would remain above 80% for 10 years. Given continued evolution of battery chemistry, manufacturing, and in-vehicle control strategies including thermal management of the battery, the record shows that all manufacturers are expected to meet this requirement with sufficient margin for compliance. Further, for the first few years of the more stringent requirement, the adopted program explicitly provides that decisions of noncompliance cannot happen unless vehicles in the test sample group actually fail to retain at least 75% of the certified range rather than the 80% they were certified and designed to meet. This interim compliance criteria provides even further assurance to manufacturers that, even if they mistakenly slightly underpredicted some aspect of degradation, they are not likely going to be subject to a finding of noncompliance.

The additional lead time before the more stringent durability requirements begin will provide ample time to vehicle manufacturers to continue to refine their battery designs, their on-vehicle controls including for charging and thermal management of the battery, and their knowledge of how and what causes degradation in-use. This will better enable them to implement appropriate counter measures, if necessary, to prevent further erosion of durability or even improve it as they seek further cost reductions.

In accordance with its modification to the ZEV durability requirements, staff also revised the incremental costs for ZEVs downward to remove the accounting for the higher durability initially proposed. Most notably, staff assumed a larger window of the battery's theoretical operating voltages would be used, consistent with the best in class of today's ZEVs, which resulted in smaller battery packs needed to meet the nominal range and overall lower increase in retail price to the consumer.

Regarding the range of penalties, as with all non-compliances regarding a failure of the manufacturer to adequately design vehicles to meet the adopted standards, CARB's authority is consistently structured to allow enforcement up to and including recall when necessary. This does not, however, mean recall is the only or typical enforcement action for any noncompliance. As detailed in the in-use compliance regulation of title 13, CCR, section 1962.7(f)(3), the Executive Officer must consider the impacts of each noncompliance on several factors to determine what, if any, corrective action is required to remedy the noncompliance.

2. Comment: 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. 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, 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. [OP-78]

   Comment: 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. [OP-78]

   Comment: The EV battery durability provision will result in EVs for sale in California having less range at the same cost and weight as identical EVs for sale in other states. [T1-7]

Agency Response: The commenter is presuming that some or all manufacturers will choose an unlikely approach of holding back some battery capacity (and accordingly, electric driving range) in order to meet the adopted ZEV durability requirements. The newly adopted requirements do not compel or encourage manufacturers to retain a portion of their battery 'in reserve'.

Battery or other component degradation (and their consequent reduction in vehicle range) are directly related to the ability of the battery to store energy and the other components to convert that energy into propulsion. As such, a degradation results in a proportional drop in range relative to what it started as new. For example, a battery that loses 10% of its energy storage would be expected to cause a corresponding near 10% loss of range regardless if the vehicle started with a 200 or 400 mile range. The newly adopted durability requirement similarly is tied to a percent reduction in original range, not an absolute loss of the number of miles.

The commenter's approach would be completely inappropriate to achieve the intended purpose of increasing consumer confidence in the durability of the ZEV technology. For example, a consumer that likely paid a premium to get a vehicle with a longer range would not be expected to accept a faster and larger amount of degradation in that longer range as a result. In fact, the consumer would likely expect the opposite in choosing to purchase a longer range to meet their needs even when accounting for some expected degradation. With the approach suggested by the commenter, a 200-mile range vehicle could only lose 20% of its initial range over 10 years but a 400-mile vehicle would be able to lose 60% of its range over the same 10 years and somehow be equally acceptable to consumers because it still has the same 160-mile range at the end of 10 years. That is inconsistent with the intent of increasing consumer transparency and confidence in durability.

Furthermore, industry and suppliers largely agree that routinely using a smaller portion of the battery's range from minimum to maximum voltage (e.g., to use 10% of a 400-mile vehicle's range to travel 40 miles per day rather than using 20% of a 200-mile vehicle's range to travel those same 40 miles) has a smaller impact on degradation of the battery itself. This means that the long-range vehicle, inherently will likely have better durability than the short-range vehicle given comparable usage patterns. And, most in industry agree that a gradual degradation in battery energy storage can be expected from new but once it reaches something below 50 to 60% of its original energy capacity, it will begin to degrade very quickly to an unusable state. Allowing high-range vehicles to have a substantially larger amount of degradation in the first 10 years would also have the impact of greatly increasing the likelihood of the need for a battery replacement in that vehicle's remaining life after 10 years which again would undermine consumer confidence in both new and used ZEVs and increase cost for consumers.

Some manufacturers have utilized such an approach in the past and some manufacturers have stated that they would evaluate whether to utilize such an approach should the durability requirement exceed their expected durability.

Additionally, with the revisions in the First 15-Day Notice that softened the durability requirement to where most manufacturers currently are at, it seems extremely unlikely that any manufacturer would pursue such a strategy in part or in full because of the durability standard. See agency response to Comment B-1 for CARB's approach to developing the ZEV durability requirements.

3. Comment: 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. 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). [OP-78]

   Agency Response: CARB considered this comment on the absence of a durability requirement not having a negative affect on the used ZEV market and disagrees with this commenter's assertions. See agency response to Comment B-1 for cites to several consumer surveys including two by Cox Automotive noting reluctance or hesitancy to purchase ZEVs because of concerns regarding battery durability, remaining life, and replacement costs. Further, even a recent news article[6] quotes representatives from Cox Automotive's and Carvana's auction houses about the uncertainty of the battery state of health at time of auction and steps they are taking to try to address it to properly value a used ZEV. Given the uncertainty regarding the current state and remaining life of the battery, there is already an impact on the used car market that the durability standard (combined with the battery warranty and requirement to display the battery state of health) should help mitigate. See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirements. See agency response to Comment B-2 for CARB's response to the commenter's assertion that this requirement disproportionately affects long-range ZEVs.

4. Comment: 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

[6] Irwin, John. "Auction houses grapple with pricing used EVs. As the number of used battery electric vehicles rises, auto auction houses are grappling with how to factor battery health and expected degradation into the value of an EV," Automotive News, August 20, 2022. https://www.autonews.com/mobility-report/auto-auction-houses-grapple-pricing-used-evs, accessed September 8, 2022

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. 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, and will decrease overall sales. [OP-78]

Comment: Commenter recommends that CARB align its durability requirements with its ZEV warranty requirements (i.e., 70 percent capacity by 10 years/150,000 miles for 2026-2030 model years, 75 percent capacity by 10 years/150,000 miles for 2031 and later). [OP-98]

Agency Response: CARB considered this commenter's suggestion to align its ZEV durability requirements with its ZEV warranty requirements. Battery warranty and vehicle durability standards serve two different purposes in increasing the likelihood of ZEVs fully meeting the needs of new and used vehicle buyers. As described in the ISOR, battery warranty ensures no individual vehicle owner ends up with a battery that has substantially worse degradation or failure than expected for any vehicle user in the first 8 years (note the final adopted proposal for battery warranty is 8 years/100,000 miles and not 10 years/150,000 miles as listed by the commenter). Effectively, battery warranty is there to protect vehicle owners that got a defective battery. Vehicle durability requirements, on the other hand, ensure that the vehicle model was adequately designed to protect for degradation or failure of any propulsion-related component in addition to the battery itself that results in a significant loss of electric driving range in the first 10 years. Accordingly, it is structured as a requirement on a class of vehicles, not any individual vehicle, and is primarily about avoiding designs that, on average, result in early and rapid degradation that will likely need replacement of potentially expensive components within the life of the vehicle. Vehicle models, on such a trajectory as a whole, could lead to wider spread doubts on the durability of ZEVs, delay transition of used car buyers to becoming used ZEV buyers, and unnecessarily consume additional raw materials and cause increased GHG emissions associated with the manufacture and replacement of significant components, such as a battery pack on a used ZEV. With a 10-year term for the vehicle durability standard at the levels established in the final adopted proposal, there is higher assurance that the typical vehicle will see a rate of degradation that allows the key propulsion components such as the battery pack to outlive the vehicle's life on the road without a routine need for replacement. Such an outcome would be optimal in the consumption of raw materials with only one battery pack ever needed for most cars while allowing for some manageable amount of degradation and

(hopefully) an acceptable loss of utility in the driving range of the vehicle such that it meets the needs of a typical used car buyer.

And while the commenter cites newer Model 3 data suggesting more aggressive deterioration in the first couple of years, the commenter has previously published Model S data in their sustainability report showing average durability well above even the more stringent proposal for 2030 and subsequent MY, which was included in the ISOR assessment of ZEV durability.

Overall, CARB directed staff to address suggestions and concerns such as these, and ultimately adopted a lower ZEV durability requirement than proposed in the ISOR. See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirements.

5. Comment: 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. [OP-78]

   Agency Response: CARB considered this commenters suggestion to abandon the ZEV durability requirement for a resporting requirement, and ultimately adopted a ZEV durability requirement with a less stringency phase-in in the first four MYs. See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirements. While reporting requirements can play an important role in tracking progress or compliance with requirements, the timeline for needed emission reductions from a successful transition to ZEVs precludes an approach that would adopt reporting requirements beginning in 3 to 4 years, to then track degradation of batteries for the next 10 to 15 years, to then analyze and adopt subsequent requirements for 3 to 4 years later, for a total of 16 to 23 years for the start of implementation today. Further, battery technology continues to evolve at such a rapid pace, along with manufacturers' understanding of the mechanisms for degradation and ways to avoid them through manufacturing and control processes, that any such knowledge would have limited applicability to whatever emerging technologies would be deployed 20 years from now. Establishing clear targets, with feasibility based on today's state of knowledge, provides a more meaningful requirement for manufacturers to work towards in their designs. Additionally, Resolution 22-12 directs staff to track and monitor the progress of technology and manufacturers towards this and other requirements to report back to CARB as necessary including further revisions where warranted.

6. Comment: 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? [OP-78]

Agency Response: While staff acknowledge increased precision in any inclusion or exclusion criteria is always preferred by engineers, the rapidly evolving state of ZEV technology and differences in battery chemistries and control strategies across manufacturers precludes such precision. As described earlier, key parameters that are suspected of adversely affecting durability are required to be tracked in a standardized format and the enforcement criteria indicate that the Executive Officer will use good engineering judgment given the state of knowledge at that time on which, if any, of these parameters do actually have an appreciable impact and what level of activity is excessive relative to typical consumer usage. Across industry as of today, there is not a consensus on whether all of the tracked parameters will have an impact or not—some manufacturers have indicated their designs and controls are robust to such events and they neither plan to limit nor discourage customer usage. In other cases, some manufacturers have expressed significant uncertainty in what future customer usage of such features like vehicle-to-grid capability might entail. Over time, as staff continues to track manufacturers' progress and the evolving technology, it is expected that future regulatory revisions could include elimination, addition, or modification of the currently tracked parameters as well as more precise inclusion/exclusion criteria should the industry and consumers coalesce around a more known scope of typical behavior much like has happened with gasoline internal combustion engine vehicles and the refinement over time of the exclusionary criteria used in sampling such vehicles for compliance.

7. Comment: [T]he "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 pause its implementation until after MY 2030 so that better battery durability and usage data are available to inform such a requirement. [OP-78]

   Agency Response: CARB considered this commenters suggestion to abandon the ZEV durability requirement for a resporting requirement, and ultimately adopted a ZEV durability requirement with a less stringency phase-in in the first four MYs. See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirements. Conversion of the fleet to predominantly ZEVs as expeditiously as possible necessitates increased consumer confidence in ZEV durability, especially on used ZEVs. Further, manufacturers are already required to design their vehicles to work in-use for the vehicle's expected life. That necessarily entails that the manufacturer plan for the full spectrum of expected usage of features it provides to consumers such as fast charging or vehicle-to-grid capability. That, in itself, requires the manufacturer to make assessments about what is reasonably foreseeable in the future for customer usage of such features and to implement appropriate designs and control strategies. The requirement for the Executive Officer, in hindsight several years later, to similarly assess what was likely reasonably foreseeable to the manufacturer is an even easier task because the Executive Officer has that added benefit of having already seen what industry has implemented across the board in respect to such usage and can more readily identify trends in what was expected and designed for.

8. Comment: The EV battery durability provision will limit the ability for them [customers] to fully unlock features that provide electrical grid resiliency, and it will force manufacturers to put limits on fast charging and V2X. [T1-7]

   Agency Response: CARB considered this comment, which suggests that, because of the durability standard, they will need to limit what customers are allowed to do regarding use of the vehicle to power other devices (e.g., vehicle-to-grid) and for fast charging. This in turn means that absent the durability requirement, they will not need such limits and could provide more capability to the consumer, albeit at the expense of degrading their battery so severely that it would lose more than 20 to 30% of its driving range in the first 10 years. Staff agrees that it would be concerning to allow vehicle users to make use of features that the manufacturer has built into the vehicle and advertised while unknowingly rapidly degrading their battery such that it compromises the ability to meet their driving demands. Accordingly, it is expected that manufacturers will impose limits in their control strategies to prevent consumers from adversely impacting their battery and/or provide explicit guidance to consumers about the impacts on battery durability of using these features and what level of such actions would render them ineligible for warranty coverage of the battery itself. The suggestion that such actions would be left unbounded for the vehicle user to do whatever they want regardless of impact on the vehicle is nonsensical. Modern day vehicles have numerous layers of controls to prevent actions or sequences of actions that would result in substantial harm or degradation to the vehicle from alerts through dashboard gauges and warning lights to progressive levels of restricted engine or speed operation to avoid continued operation in damaging conditions such as when the engine is overheating or has insufficient oil pressure.

   See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirements.

9. Comment: As for battery durability, MBAG supports providing SOH information as in the UNECE GTR. This could be seen as analogous to the In-Use Monitoring Performance Ratio (IUMPR) data submission requirements for Conventional vehicles. [OP-120, 15-17]

   Comment: To enable battery innovations to reach market readiness without forcing reserve capacity in the short term, Rivian suggests decreasing the SOH requirement to more closely align with either the proposed ZEV warranty standards or the United Nations Global Technical Regulation (UN-GTR), or initiating the requirement in 'data gathering' mode. [OP-127, B1-10]

   Comment: Commenter requests CARB to initial proposal in data gathering-only mode. [OP-148, 15-17, 15-33, T1-39, B1-35]

   Comment: Commenter requests that the durability provision be modified to initiate in data gathering only mode to avoid a negative EV sales impact in California. [T1-7]

   Comment: With rapid and recent battery technology development and implementation advancements, CARB could initiate the durability requirement in 'data gathering' mode. This would allow CARB to update ACC II regulations in a few years

with more representative data. The "data gathering" mode could also be paired with less stringent initial durability requirements to provide CARB with higher mileage data while still allowing for an assurance measure as initially intended by staff. [OP-127, B1-10]

Agency Response: CARB disagrees that it would be appropriate to further reduce the stringency of the durability or warranty requirements to align with the United Nations Global Technical Regulations (UN GTR) and only require data-gathering rather than adopt a ZEV durability requirement. See response to Comment B-18 as to why data-gathering is not a sufficient approach compared to adoption of a ZEV durability requirement.

The proposed UN GTR has less rigorous requirements that are easier for manufacturers to implement partially due to the process by which representatives of regulatory agencies and vehicle manufacturers must reach joint consensus before it becomes a GTR. Further, the GTR is meant to be a template for regulatory bodies to use; in actual practice the adopting entity can and often does make changes to fit their needs and political pressures. Thus, even if GTR is eventually adopted somewhere (currently no regulatory body has adopted it), there is still no certainty that the final requirements will align across jurisdictions or with the current GTR language.

With respect to the actual technical differences, the GTR state-of-health (SOH) data is set up to track the battery health, as is the CARB requirement. However, unlike the CARB requirement, the GTR proposal did not provide explicit direction to manufacturers for some implementation approaches such as the case where some portion of the battery capacity is held back 'in reserve' early in life and gradually opened up to counteract the actual degradation. Accordingly, manufacturers will be able to implement such an approach and completely undermine the intent of the SOH parameter by continuing to report the heath as 100% (or even a value greater than 100%) well into the degradation of the battery. This artificial reporting could destroy the credibility of the reported parameter and render it near useless for vehicle owners to use to validate warranty eligibility or to properly value used ZEVs based on the amount of degradation of the battery.

10. Comment: Commenters ask for the proposal to align with the United Nations rules on battery durability. [T1-12, T1-14, B1-5, B1-10, B1-35, T1-68, , OP-127, OP-133, OP-134, OP-148, OP-176, 15-17, 15-33, OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34

    Comment: Commenter suggests CARB staff to work with manufacturers to adopt battery performance requirements that reflect existing international standards to avoid cost increases for ZEVs and PHEVs in California. [OP-176]

    Comment: Commenter states that they agree with AAI comments and recommends that CARB realign their durability requirements with the United Nations In-Vehicle Battery Durability Global Technical Regulations (UN GTR) recently published on April 19, 2022. While the ability to achieve the UN GTR ≥70% remaining useable battery energy for 8 years or 100,000 miles will be challenging, this requirement was co-developed with industry and regulatory agencies over the past few years. Aligning to

the global technical regulation will also streamline design requirements, avoid a patchwork of requirements, and provide data to enable future consideration of a range durability requirement. Regulatory bodies from the European Commission, United Kingdom, and Japan have indicated their intention to adopt UN GTR recommendations and more countries are expected to follow in their future regulations. [OP-95]

Comment: CARB should align the durability requirements with the United Nations Economic Commission for Europe (UNECE) Global Technical Regulations (GTR). These regulations were developed over several years by stakeholders representing governments, including EPA, and industry throughout the world. The UNECE GTR opted for Useable Battery Energy (UBE) rather than range because it focused solely on the durability of the battery. Range can be impacted by how customers use their vehicles as well as by many other factors that the auto manufacturer cannot control in the design of the battery or vehicle. As was outlined in the Alliance for Automotive Innovation's comments, we support using a Minimum Performance Requirement (MPR) where batteries must maintain at least 80% State of Health5 (SOH) after 5 years or 100,000 km (62,000 miles) and 70% SOH after 8 years or 160,000 km (100,000 miles). Additionally, MBAG firmly believes that CARB should monitor what is going on in Phase 2 of the GTR where data on range will be collected and analyzed, so that CARB can possibly adopt future standards based on that assessment. As currently written, the requirement will result in additional costs without emission benefits. [OP-120, 15-17]

Comment: Commenter is overall supportive of the direction and goals of the proposal, but requests alignment with the United Nations global technical regulations. [T1-39, B1-35]

Agency Response: Overall, CARB directed staff to address suggestions and concerns such as these, and ultimately adopted a lower ZEV durability requirement than proposed in the ISOR. See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirements. The UN GTR has only adopted the framework for a battery durability standard. This leaves out any other component degradation in the electric propulsion or charging system even though it leads to the same impact to the consumer—loss of electric driving range. Second, the GTR approach necessarily is reliant on the regulating body's access to telematics data from the vehicles to obtain a very large sample of on-road vehicles in order to make a determination. CARB's approach, on the other hand, involves more resource-intensive laboratory testing on a much smaller sample size but avoids the need or use of telematics data (and the associated risks and concerns regarding consumer privacy and security that go along with such data). Third, the GTR has only created a framework for reporting a battery SOH without actually establishing a clear compliance path to actually determine compliance and as noted above, no actual regulatory body has yet adopted any or all of the GTR as an official requirement. California's need for criteria pollutant and GHG reductions necessitates timely action designed to achieve a successful transition of the fleet. This precludes the adoption of an approach that has not yet been adopted by any entity, may not establish any potential criteria for many years, and lacks enforceability.

11. Comment: The GTR requirements were established based on the outer envelope of current cell technology. The ISOR proposed requirements that go beyond the GTR profile can only be met by "simulating" the required degradation profile, meaning automakers may need to electronically limit the customer useable energy capacity, since the proposed durability requirement is misaligned with capability of existing/known battery technology. This will have negative consequences on EV consumers, since they won't have access to the battery capacity (and range) included in the vehicle price. The extra cost will impact the initial buyer, but the extra weight and extra consumed package space will impact all users of the vehicle throughout its life. Moreover, there will be a wide statistical distribution of remaining range in used EVs, and some 10year-old vehicles will have a healthy level of remaining range and battery in any scenario. Adding extra "hidden" or "reserve" cell capacity to new vehicles will certainly skew that used-vehicle distribution, providing statistically more healthy vehicles at 10 years. But it will increase the cost and weight of every new EV, and at exactly the wrong time – when automakers, agencies, and governments are trying to transform the buying habits of every single vehicle customer in America. A single global durability standard for vehicles that produce zero emissions throughout their life allows automakers to develop and implement global platforms, reducing costs and improving quality compared to a patchwork of requirements around the world. A patchwork of requirements will not reduce emissions. Instead, it will add costs – substantial costs. We share CARB's goal in working to ensure that clean and zero emission vehicles become accessible to all people and develop a robust and reliable second-hand market. In theory, this dependability will drive down costs of new vehicles, as well as produce a rich market of second-hand Evs, making them even more accessible for lower-income customers. However, the durability requirements in the ISOR may have the opposite effect. Imposing an 80% range requirement at 10-years/150,000 miles on all EV traction batteries will have consequences that may hinder the EV adoption. EPA and other global regulators have concluded that more time is needed to develop robust durability requirements for range. As was recognized by the IWG, postponing the consideration of a range requirement until Phase 2 of the GTR in favor of a SOH metric is the best path forward. This allows the workgroup and regulatory bodies to gather and analyze sufficient data from Phase 1 to establish an appropriate battery durability standard moving forward. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

    Agency Response: Overall, CARB directed staff to address suggestions and concerns such as these, and ultimately adopted a lower ZEV durability requirement than proposed in the ISOR. See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirements, and agency's response to Comment 10 on why CARB did not adopt the UN GTR proposal. Additionally, staff disagrees with the characterization that the GTR requirements were "established based on the outer envelope of current cell technology." Staff participated in several GTR discussions with international and federal regulatory partners and it was made clear that much of the assessment and modeling was heavily influenced by early Nissan Leaf battery performance, which is known throughout industry to have suffered far more significant battery degradation than current battery technology. In such a reliance on

this outdated technology, the GTR provisions are under-estimating what is already typical and expected battery behavior and results in overly lax requirements rather than a suggestion that they were based on the outer envelope of advanced cell technology.

12. Comment: Rivian seeks clarification on certain elements of the propulsion system active definition. The examples, "remote activation to precondition the cabin" and "(HVAC) turned on to condition cabin prior to driving," lead to some ambiguity in the case of vehicles with "non-traditional" vehicle power moding and propulsion system moding with multiple options available to the consumer regarding "cabin conditioning", and without inclusion of a start-stop button. Cabin conditioning may not always align with an intent to drive the vehicle, and ambiguity caused by these aspects of the definition in conjunction with complex state machines surrounding true entry to propulsion system active may lead to non-uniform implementation of propulsion system active across manufacturers or potentially across products in a single manufacturer. Additionally, referencing "is enabled by the driver" may not sufficiently account for driver-less vehicles in the future.

    Comment: Rivian notes that the definition as proposed does not precisely capture the activities that we understand CARB to be targeting, and that this may skew the enforcement of provisions proposed under §1962.7. This ambiguity will result in varied implementation across those vehicles taking a "non-traditional" approach to power modes and propulsion system modifications, which, in turn, will result in inaccurate or un-comparable data for all standardized data requiring incorporation of propulsion system active. Such inaccuracies will have specifically severe effects in relation to vehicle selection for enforcement testing as proposed per §1962.7. We believe this definition of propulsion system active creates sufficient ambiguity to materially influence metrics used to determine eligibility for inclusion in durability testing. Rivian asks that CARB staff clarify the elements of the propulsion system active definition leading to ambiguity and consider clarifying the definition of "driver" in the case of future driver-less vehicles. [OP-127, B1-10].

    Agency Response: With the adopted requirements, there is a definition of propulsion system active that provides sufficient direction to manufacturers as to how to implement standardized data intended to track key metrics while the vehicle is being used. Staff acknowledges that the concept of a driver-less vehicle—one that is never intended to be operated by a human driver and has no controls for such interaction with a human—does not necessarily fit within the conventional definitions of propulsion system active operation. However, such vehicles do not necessarily fit within many of CARB's requirements, which were always structured around interaction with a human operator and maximizing emission control whenever a source of emissions (e.g., the combustion engine, the gas tank, etc.) existed. Staff will continue to work with manufacturers through the SAE committee that defines the standardized parameters to meet CARB requirements and, where necessary, accommodations for driver-less vehicles can be planned for and included with future regulatory revisions or updates.

13. Comment: Commenter recommends to consider enforcement action only when greater percentage of in-use tested vehicles are below the regulated state-of-charge levels (i.e., as compared with the proposal for greater than 5 of 10 tested vehicles). [OP-98]

    Agency Response: The durability requirements are intended to protect that, on average, vehicles within a vehicle model or class are designed to have sufficient durability. This acknowledges that not all vehicles are used in an identical fashion and ultimately, how you use the vehicle will affect its durability trajectory. For the compliance determination of such a requirement, the procedures allow for exclusion of vehicles with history of an event that may render it non-representative as well as vehicles with indication of 'excessive' use of features suspected of having a direct and significant impact on battery durability such as cumulative time spent at high temperature or the amount of fast-charging the vehicle has been subjected to. After the exclusion of such vehicles, then the pass/fail criteria is based on 50% or more of the remaining vehicles in the test sample being at or above the required durability. When put together, this increases the likelihood that any test group that fails is an indication of a true population where less than half of the vehicles are meeting the required durability requirement. If the compliance requirement were to be shifted to an even smaller fraction of the population that needed to pass, it would render the durability requirement less and less meaningful to the average consumer thereby undermining the intent of the requirement itself. For instance, if only the best performing 25% of vehicles had to pass the durability requirement, it would leave 75% of the users without a meaningful minimum requirement and would be unlikely to achieve the intended purpose of addressing consumer concerns related to unknown durability of the relatively new ZEV technology.

14. Comment: Commenter is concerned about the 2026-2029 model year test sample group nonconformance finding threshold of, "… more than 30 percent of the vehicles in the test sample group fall below 65 percent of the certified all-electric range". [15-15]

    Agency Response: Overall, CARB directed staff to address suggestions and concerns such as these, and ultimately adopted a lower ZEV durability requirement than proposed in the ISOR. See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirements. However, an additional 10% of degradation in range in the first 10 years is a very substantial relaxation relative to the expected degradation based on projections by manufacturers and suppliers. During the re-evaluation, staff also looked at manufacturer's projected trajectories for median or 50th percentile type customers and for extreme 99th or greater percentile customers. And while many projected the 50th percentile to be at or above 80 percent of the original range by 10 years, staff acknowledges that many manufacturers would have likely been uncomfortable without some increased margin of compliance or added confidence in the accuracy of their projections. However, when looking at the trajectories relative to the 70% retention of range, manufacturer projections showed significant margin for the vast majority of their fleet to remain above that. For context, virtually every manufacturer offers warranty out to 8 years for anything that falls below 70% today. And, given the high cost of the battery and manufacturer's past practice of designing to minimize warranty expenses, manufacturers would be expected to be

designing for a 2.5 to 3 sigma deviation from mean to be above the 70% meaning 99.3% or more of the population would be above 70% range at 8 years. Extrapolation of that trajectory with those of the typical mean customer's projections gave staff confidence that holding only 50% of a manufacturer's fleet to the 70 percent minimum range would be less rigorous than what they were currently able to do on existing ZEVs and setting a requirement there would be meaningless. In continued discussions with several manufacturers, staff confirmed that manufacturers were already on a path where the vast majority of the fleet should be retaining 70% of the original range through 10 years and developed the 70% of the fleet retaining at least 70% of the original range as an appropriate interim requirement.

15. Comment: Commenter recommends CARB consider reviewing manufacturer-submitted in-use compliance validation testing data at the time of certification to give confidence that the technology and calibration is robust. [B1-1]

    Agency Response: CARB concurs this this commenter's suggestion to review manufacturer's submitted data. As part of the certification application, manufacturers are explicitly required to submit development and/or other data confirming that they have adequately designed the vehicle model to meet the minimum durability standards. Such data are expected to include testing with prototype or pre-production components or vehicles and artificially aged battery cells or packs to simulate the expected degradation at various points in a vehicle's life. Manufacturers are also required to submit vehicle test data at the time of certification but this is predominantly new vehicle testing and would not be particularly informative as to how much degradation vehicles will typically encounter over the first 10 years of operation.

16. Comment: Regarding 15-day comments, commenter has remaining concerns about the enforcement testing protocol, and recommends several changes to align the procedure with existing in-use testing procedures while significantly streamlining the requirements: adjustments to the proposed in-use testing pass/fail criteria to align with existing in-use testing procedures; and a similar structure for battery durability, as follows: 1) a 50% pass/fail threshold, and 2) an exceedance range of approximately 10% on the pass/fail measurement, evaluated on the average of the tested group. [15-30]

    Agency Response: The explicit criteria of title 13, CCR, section 1962.7 for determination of noncompliance were carefully selected by staff in the context of the performance requirement that was being evaluated. In general, the regulation provides three distinct categories for a finding of noncompliance and a specific pass/fail criterion within each category. This structure is similar to that used for conventional vehicles where the failure criteria can vary to best align with the performance requirement such as a 50% failure criteria where vehicles must be designed, on average, to meet the requirement. It would be inappropriate to similarly use a one-size-fits-all 50% failure criteria for requirements in which all individual vehicles are required to meet the requirement. Regarding the comment requesting an exceedance range of approximately 10% on the pass/fail measurement, the regulatory structure already provides, where appropriate, interim in-use thresholds for a limited number of MYs. These relaxed in-use thresholds of 65% and 75% of range for MYs where the durability requiriement is 70% and 80%, respectively and for 8 percentage points battery SOH accuracy in lieu of 5 percentage points for the first three MYs of

the program, in general, provide additional compliance margin for manufacturers in the early years of new requirements as they gain experience and have increased risk that they have under-estimated or failed to properly account for some element of customer usage. However, it would be inappropriate to continue such additional margin for all future years as it would effectively undermine the actual adopted performance requirement itself.

17. Comment: CARB received comments of support for its modifications to the durability standard subsequent to the June 9, 2022 Board Hearing. [T1-63, 15-8, 15-15, 15-19, 15-27, T2-25, T2-41, T2-37]

    Comment: The updated proposal reduces this requirement from 80-percent to 70-percent certified range for model years 2026-29. This amendment to the rule will have an adverse impact on future ZEV adoption, as these provisions are especially critical in achieving consumer confidence in the secondary ZEV market… reduced capacity or complete failure of the battery pack represent a significant risk to emissions reductions, given the potentially high cost of a replacement, on both the consumer and the environment. Strong corresponding consumer protections regarding durability, battery health and warranties are therefore critical to the emissions and economic success of the ZEV program…. As infrastructure investments and technology continue to become more commonplace, this perceived barrier to adoption may ultimately be addressed, but until this technology is widely accessible, California should seize the opportunity to bolster consumer confidence that their ZEVs will maintain condition, reliability, and durability throughout their useful life… This rule has the opportunity to establish a strong durability provision that will set the standard for vehicle durability in the ZEV market, and CARB should take the necessary steps to adopt the strongest standard of consumer protections possible. [15-21]

    Comment: Commenter expresses concern with the 15-day changes that will reduce the ZEV range durability from 80 percent to 70 percent certified range for model years yelling '26 to '29, as this change will have adverse impacts on future ZEV adoption, since these provisions are especially critical in achieving consumer confidence in the secondary ZEV market. [T2-19]

    Agency Response: While CARB appreciates support for the ISOR ZEV durability proposal, following direction given at the June 9, 2022 hearing, staff did re-evaluate the durability requirement and proposed softer requirements for the early years that were subsequently adopted by CARB. See agency response to Comment B-1 for CARB's approach to the developing the ZEV durability requirement.

18. Comment: Enforcement of a durability standard in the regulation's early years—as opposed to a "data gathering" provision only—is premature, and the 15-day changes represent meaningful movement toward a more practicable standard with a more appropriate approach to enforcement and test sample composition, therefore the commenter supports CARB's adoption of these provisions. [15-18]

    Agency Response: CARB appreciates the commenter's support. Per the Board's direction at the first Board hearing, staff did re-evaluate the durability requirement and proposed softer requirements for the early years that were subsequently adopted

by CARB. However, even with the revisions, the requirements are still enforceable requirements that can result in a manufacturer found to be noncompliant and subject to corrective action to address the issue. Where appropriate, the regulation provides some even less stringent criteria used to make pass/fail decisions than the actual required design and performance criteria in order to provide manufacturers with some additional compliance margin in the earlier years should their vehicles be subjected to unexpected rates of degradation. In staff's experience, such an approach better balances forward progress with the risks to a manufacturer when having to meet newly established requirements rather than a strictly data-gathering approach that has no enforcement jeopardy.

19. Comment: 1962.7(a) Applicability. This regulation was originally developed for ZEVs only and did not include PHEVs. However, in the most recent version it applies to all PHEVs. PHEVs fall into three categories – non-credit generating PHEV, transitional partial credit PHEVs, full 1-credit PHEVs. Each of these categories should have different requirements throughout the regulations. However, for in-use PHEVs are already covered by existing in-use regulations, and to the extent that additional requirements should be included in in-use testing, those additional requirements should be placed in the existing in-use test procedures for those vehicles. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95,T2-34]

    Agency Response: CARB concurred this with commenter and adopted changes to the applicability section cited for the final adopted proposal to make more explicit that section 1962.7 only applied to PHEVs certified to earn vehicle values and only applied for the purposes of verifying newly imposed requirements of title 13, CCR, section 1962.5 on those PHEVs.

20. Comment: In the event of any potential in-use enforcement exceedance, recommends that the first action is that CARB allow the manufacturer to provide an extended warranty for 10 years or 150,000 miles to owners of the applicable vehicles. Having this as the first action, preceding discussions between the company and regulators about a model-wide recall, will be the quickest and most effective way for manufacturers to immediately address any such issue and related costs for impacted ZEV drivers. These changes are warranted due to the nascent state of automotive battery developments. [OP-98]

    Agency Response: While the adopted regulations explicitly define the criteria to be used to determine if a vehicle model is noncompliant, the specific remedy for noncompliance is not pre-defined. Given the noncompliances can span a great variety of root causes or consumer-facing impacts, decisions as to the appropriate corrective action are made on a case-by-case basis if and when noncompliance is determined. While the upper limit of corrective action under the regulations is limited to recall, and other remedies are available in the form or injunctive relief and potential penalties or fines, the Executive Officer may seek lesser forms of relief to adequately address the issue in each unique case. In some cases, an extended warranty provision may indeed provide an adequate resolution to noncompliance but it would be inappropriate to suggest that such a resolution would be appropriate in all cases of noncompliance.

C. ZEV Warranty and Warranty Enforcement

1. Comment: Commenter requests CARB remove the warranty requirements for propulsion-related equipment since battery-electric vehicles have no emissions. [15-17]

   Agency Response: As described in the ISOR, the ZEV warranty requirements are not an extension of the gasoline 'emission-related' warranty but instead are one of the many assurance measures adopted in the final proposal to increase the likelihood of a successful transition to a predominantly ZEV fleet thereby ensuring the emission reductions are achieved. Potential new and used car buyers have expressed reservations regarding the newness of ZEV technology and not having the same level of confidence as they have with gasoline vehicles with respect to durability and reliability. A minimum required warranty only for propulsion-related components increases the motivation for manufacturers to design and build robust vehicles and to protect consumers in the unlikely event that a component prematurely fails. In turn, this should lead to a higher proportion of consumers that are willing to purchase ZEVs that is needed to support a transition in the light-duty vehicle fleet and achieve the expected emission reductions.

2. Comment: Commenter is pleased CARB provided a clearer definition of a "propulsion related part" in sections 1962.5(b) and 1962.8(a), but notes that the definition is not exactly the same in the two sections and recommends aligning them and deleting select words., as follows: "Propulsion-related part" means any ~~original equipment~~ system, component, or part whose failure will directly impede the ability ~~on a zero emission vehicle to~~ …" commenter recommends deleting the terms "original equipment" and "on a zero emission vehicle to," resulting in the revised phrase, "Propulsion-related part" means any system, component, or part whose failure will directly impede the ability …." [15-17]

   Agency Response: While similar, the term was uniquely defined in each regulation to achieve the intended purpose for the specific regulation and in the context of how that term is used in that particular regulation. For example, the mention of original equipment as an adjective to the components is specific to the data standardization regulation because it also clarifies implications to which components (and the diagnostics of such components) that the requirements apply to. The requirements are intended to limit manufacturer's liability to reporting fault codes for diagnostics of the original equipment components and parts that are propulsion-related and such liability does not extend to any aftermarket add-on or modified components subsequently installed on the vehicle even if they otherwise would meet the definition of a propulsion-related component. For the warranty regulation of title 13, CCR section 1962.8, the same limitation is not applied to the definition because elsewhere in the regulation, the warranty obligations explicitly describe what provisions apply to original equipment components versus aftermarket components.

3. Comment: The definition of propulsion-related part, even as amended, provides sufficient certainty on what parts are covered, and suggests adding the word "electronic" to the definition of "propulsion-related part" in section 1962.8, so the

definition becomes: "Propulsion-related part" means any electronic system, component, or part…" [15-17]

Agency Response: CARB considered this commenter's suggestion to limit the definition to 'electronic' systems or components which would effectively exclude any mechanical components and did not modify the regulation. Warranty coverage is not intended to be limited to only electronic components and it would undermine the purpose of the warranty requirement by excluding a subset of propulsion-related components from coverage even though the consumer-facing impact (i.e., the vehicle is no longer able to be driven as designed) is identical. This is also consistent with current warranty coverage provided by most manufacturers for ZEVs and with all manufacturers under the emission-warranty requirements where many purely mechanical, non-electronic components are included in warranty coverage.

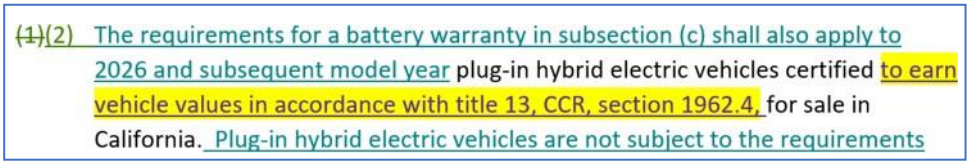
4. Comment: Commenter says that in section 1962.8, the definition of "Propulsion-related part" is an important definition, but as written, it is overly broad. For example, a drive shaft, axle, or tires could be used to "propel the vehicle." Commenter recommends editing the proposed text as follows. In the first sentence, add the term "electronic" and replace the term "part that is used" with the term, "whose failure will directly impede the ability." The first sentence then becomes: "Propulsion-related part" means any electronic system, component, or whose failure will directly impede the ability to refuel or recharge the vehicle." At the end of the second sentence, immediately before the period, add the language, "providing propulsion, thermal management, recharging and energy storage, conversion and related diagnosis within the vehicle. Advanced driver assistance systems (ADAS) and safety-related components and systems are not considered 'propulsion-related parts' for the purpose of this regulation." [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

   Comment: Commenter states that while MBAG agrees with the spirit of the proposed "Propulsion-related part" definition, the phrasing provided in the ISOR is overly broad and risks regulating components that are out of scope such as a drive shaft, axle, or tires. MBAG supports the proposal made by the Alliance for Automotive Innovation to refine the definition as follows. In the first sentence, add the term "electronic" and replace the term "part that is used" with the term, "whose failure will directly impede the ability." The first sentence then becomes: "Propulsion-related part" means any electronic system, component, or whose failure will directly impede the ability to refuel or recharge the vehicle." At the end of the second sentence, immediately before the period, add the language, "providing propulsion, thermal management, recharging and energy storage, conversion and related diagnosis within the vehicle. Advanced driver assistance systems (ADAS) and safety-related components and systems are not considered 'propulsion-related parts' for the purpose of this regulation." [OP-120, 15-17]

   Agency Response: In response to these comments, CARB modified the definitions through the amendments proposed in the First 15-Day Notice. The modifications were not identical to the suggested changes by the commenters but were materially similar in clarifying components that directly impede the ability of the vehicle to be

driven, exclusion of wheels and tires, and exclusion of safety-related and advanced driver assistance system components.

5. Comment: We understand this regulation applies to BEVs and plug-in hybrid electric vehicles (PHEVs) that certify to Title 13, California Code of Regulations (13 CCR) §1962.4, which is the only regulation that references this regulation. Vehicles that do not certify to §1962.4, will certify under 13 CCR §1961.4 (which does not reference this regulation, §1962.8) and follow the emissions performance and defects warranty requirements starting with 13 CCR §2035. While this is the only reasonable reading of this regulation, we recommend revising the applicability section (a)(2) as shown below for clarity.


~~(1)~~(2) The requirements for a battery warranty in subsection (c) shall also apply to 2026 and subsequent model year plug-in hybrid electric vehicles certified to earn vehicle values in accordance with title 13, CCR, section 1962.4, for sale in California. Plug-in hybrid electric vehicles are not subject to the requirements

[The image displays the beginning of section 1962.8(a)(2) as proposed in 15-day changes, plus the commenter's suggested addition of the phrase, "to earn vehicle values in accordance with title 13, CCR, section 1962.4," which is highlighted. The resulting provision suggested by the commenter is: "The requirements for a battery warranty in subsection (c) shall also apply to 2026 and subsequent model year plug-in hybrid electric vehicles certified to earn vehicle values in accordance with title 13, CCR, section 1962.4, for sale in California. Plug-in hybrid electric vehicles are not subject to the requirements".]

[15-24]

Agency Response: CARB agrees with the comment that the new battery warranty requirements apply only to PHEVs that are certified to earn vehicle values under title 13, CCR section 1962.4 and have made a non-substantive change to the applicability section to further clarify this is the correct interpretation of the requirements. Regarding ZEVs, we note that the current language remains clear that all ZEVs are required to be certified to title 13, CCR section 1962.4 and that, with the exception of neighborhood electric vehicles, all ZEVs (including those that do not meet the minimum requirements for vehicle range necessary to earn vehicle values) are required to meet the battery warranty requirements of title 13, CCR section 1962.8.

6. Comment: MBAG continues to recommend the UNECE GTR as the minimum warranty requirement, utilizing the MPR outlined above in our comments on battery durability. MBAG also recommends that CARB remove the warranty requirements for propulsion-related equipment. Since BEVs emit no emissions, there is no health impact should these parts fail. Failure of propulsion-related parts is primarily a competitive issue, and it is in the best interest of auto manufacturers to ensure that these parts meet customer expectations. In support of our customers, the Mercedes-Benz EQS comes with a 4yr/50,000 mile powertrain warranty and an industry leading 10yr/155,000 mile warranty on its traction battery. [OP-120, 15-17]

Agency Response: Staff disagrees with the commenter's suggestion to align with the battery warranty requirement drafted in the UN GTR as it is limited to an even shorter time and mileage term than any vehicle manufacturer already offers for a battery warranty. Additionally, as described in responses to Comments B-9 and B-10, the UN GTR does not provide sufficient direction to manufacturers to correctly report the battery SOH especially in cases where the manufacturer has designed the system to have some reserve capacity at the beginning of the vehicle's life. Combined, these two differences result in the GTR battery warranty being significantly weaker than the CARB adopted requirement and weaker than what every manufacturer, including the commenter, is already offering.

Regarding the warranty of other propulsion-related components, such coverage is necessary to increase the likelihood of a successful transition to a predominately ZEV fleet and as noted in response to Comment C-1. Vehicle purchasers have become accustomed to a certain level of expected reliability and warranty coverage and, for a new technology like ZEVs, the customer needs to know the manufacturer is providing an equivalent level of confidence in its expected performance. As noted by the commenter, most manufacturers are already providing such coverage without such a requirement by CARB. However, absent the newly adopted requirement, manufacturers would be able to choose when to offer such coverage and when not to, to exclude specific components that it does not want to cover even though the impact to the consumer will be similar in its adverse impact on being able to drive the vehicle, and there would be no ability for CARB to assist consumers in cases of warranty disputes or where manufacturers are not honoring their warranty commitment. It should be noted that the adopted warranty also provides extended time and mileage coverage for a subset of components that are higher-priced to ensure a higher level of robustness on major components.

7. Comment: CARB has included in the ISOR specifications for a ZEV Warranty Information Report (ZWIR), a ZEV Field Information Report (ZFIR), and a ZEV Information Report (ZIR). As defects do not impact emissions or the environment, CARB appears to be speciously mandating quality/consumer protection under the guise of environmental protection. Therefore, MBAG believes that CARB should not be mandating this type of reporting in ACC II. Nevertheless, MBAG recommends that CARB revise the defect reporting provisions to focus solely on the traction battery at the higher reporting rates listed below:

Item	Basis	ISOR	Proposed Threshold
EWIR/ZIR	Screened	4%/50	10%/125
FIR/ZFIR	Unscreened	4%/50	10%/125
EWIR/ZWIR	Unscreened	1%/25	4%/50

[OP-120, 15-17, OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

Agency Response: The ZEV warranty is not intended to protect for failures of components that directly increase vehicle emissions and instead is about reducing emissions by increasing the likelihood of a successful transition to a predominantly ZEV

fleet as necessary to meet California's clean air and GHG emission reduction obligations. See the response to comment B-1. Limiting warranty coverage only to the battery would fail to achieve the intended purpose of the warranty requirement by not giving consumers some assurance the key components to propel the vehicle have sufficient durability. Lastly, the commenter suggests changes to significantly increase the percentage of components that would need to fail under warranty before being required to submit information to CARB. In the final adopted proposal, CARB revised the percentage levels upward that trigger the progressive levels of reporting but not to the levels suggested by the commenter. While CARB may agree, in principle, that the levels could be raised relative to conventional vehicles, early awareness of issues through warranty reporting still serves an important role. Given the warranty coverage and associated warranty reporting is primarily limited to the first three years of a vehicle's life, it is appropriate to require reporting at fairly low levels in order to have early awareness of issues that might affect the ability of the vehicle to meet the longer-term durability requirements or otherwise identify insufficiently designed components and enable effective enforcement of the requirements. Accordingly, staff did not make any of the suggested changes to the adopted requirements.

8. Comment: 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 be 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. 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. As noted, most other OEMs offer similar warranty coverage. 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. [OP-78]

   Agency Response: CARB concurs that the 70% criteria and 8 year warranty term adopted for the first five years are aligned with what most manufacturers represent to consumers as their current warranty policy. However, the adopted requirements do strengthen these policies by dictating that the 70% be based off the percentage of usable battery energy and calculated as a standardized battery state of health parameter, by addressing how this is calculated in cases where the manufacturer has held back some battery energy in reserve early in the vehicle's life, and by requiring the manufacturers to make the calculated battery state of health parameter readable to a consumer on a vehicle dashboard display. Regarding the increased requirement after the first five years at 75%, yes, staff expects manufacturers will have to make improvements to battery thermal management, control strategies during charging and usage, and perhaps most importantly, to manufacturing processes. Warranty

coverage is not typically a mechanism triggered by aggressive usage of a vehicle or component but rather a premature failure of a component. Such failures are often a result of a manufacturing defect or design flaw that results in actual damage or failure of the component. Given the rapid advancement of battery technology including manufacturing processes, it is expected that manufacturers will continue to reduce the incidence of manufacturing defects or other design flaws that contribute to such a significant premature failure in order to be able to meet the 75% warranty criteria with an equivalent level of confidence as they have today with the 70% criteria. And as noted response to Comment B-1, staff did account for the impact on costs in later years due to increased warranty and durability stringency by sizing of the battery packs and projected cell costs.

9. Comment: Commenter states battery failures in electric vehicles are very common. And guess what, these people are not going to honor their battery warranties. They don't honor them now. You could have a battery failure in these electric vehicles that will cost 20, 30, 40 thousand dollars and they don't honor the warranties, because they blame the person operating the vehicle for the failure. So when you say you're going to have warranty periods, that's garbage, because they will get out of the warranty period by claiming it's the fault of the operator. [T2-55]

   Agency Response: CARB has a long history of requiring and enforcing emission-related warranties to ensure that manufacturers live up to their obligations to consumers. The emission warranty requirements have evolved to where they are today with disclosure of covered components to staff at the time of certification and consumers upon purchase, to warranty reporting to staff identifying frequency of individual component repairs, to the ability to audit manufacturers or their franchised dealerships for warranty records, and even to contact information for CARB staff to assist consumers in warranty disputes. For the newly adopted ZEV warranty requirements, staff built off of this knowledge from emission warranties and structured an equivalent level of checks and balances to be able to verify that manufacturers comply. These warranty requirements also clarify conditions under which a manufacturer may or may not declare the warranty invalid such as the use of aftermarket parts or the use of an independent repair shop for prior service or maintenance.

   Further, the newly adopted requirements take an added step to empower the consumer with respect to battery warranty by making the battery SOH parameter, upon which the warranty is based, directly readable to the consumer in-vehicle. With today's vehicles that do not have such a parameter, the consumer is largely at the mercy of the manufacturer's franchised service facility to determine if they do or do not qualify for warranty. And, given such warranties are completely optional for manufacturers to provide, there are no limitations on what a manufacturer may or may not decide to use to include or exclude a vehicle from warranty coverage.

   Lastly, staff disagrees with the assertion that battery failures in ZEVsare common. To date, warranty records for PHEVs have shown very low rates of battery malfunctions or repairs, and BEV manufacturers, other than the earliest Nissan Leafs, have reported very low failure rates to date as well. Certainly there are less robust data than ideal at this time given the relatively small number of BEVs on the road and their relatively

young age, but even discussions with battery recyclers have indicated a lack of volume of used BEV batteries to recycle.

10. Comment: 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. [OP-78]

    Agency Response: This comment is not directed at the proposed regulation or the process by which they are adopted. These comments request additional Board action subsequent to adoption of the proposed regulations and are therefore outside the scope of the rulemaking. Per the direction from CARB in Resolution 12-12, staff will continue to track and monitor the progress of industry and technology in the transition to ZEVs including battery warranty requirements. Based on experience, setting an explicit target well in advance of the requirement based on the state of knowledge today is far more successful in communicating a desired end state for engineers to design and develop towards without needlessly spending resources trying to overshoot an unspecified future requirement or to succumb to competitive pressure to cut costs even at the expense of current or future durability improvements. That said, staff will monitor the development of technology and, where warranted, bring proposed modifications to the Board in this or any other area of the requirements.

D. Minimum ZEV Range

1. Comment: First, the range requirement for battery electric vehicles (BEVs) should be reexamined considering a range of likely household use case scenarios. The range requirement is a primary determinant of battery capacity and battery capacity has a large impact on the modeled vehicle cost. ARB has chosen to require 300 mile and 400 mile range for BEVs, however it is likely that lower range vehicles will be part of the vehicle mix, especially in households with multiple BEVs. Additionally, increases in fast-charging infrastructure and the battery warranty provisions of ACCII could make BEVs with range lower than 300 miles useful. [OP-172]

    Comment: I do have some concerns over the regulation, for example, the 150-mile minimum for ZEVs. There are use cases for which low ranges work. And building say 300 mile -- three 100-mile cars would be a more efficient allocation of batteries than two 150-mile cars. Some customers could still benefit from having options for less range, particularly niche applications like local delivery vehicles. Further, you have vehicles like the Arcimoto FUV, the upcoming Meyers Manx 2.0 EV, and even the new

USPS delivery vehicles that have 150-mile lower range, but that number is perfectly suitable for these application. So I hope there will be some wiggle room on that minimum requirement. [T2-50]

Agency Response: Assumptions used by staff in modeling costs are meant to represent average vehicle costs with actual costs for some vehicles being lower and some being higher. In the case of BEVs, a 300-mile nominal BEV was used for cost assessment to represent a range of vehicles that could likely vary from the low or mid 200-mile range to the mid 300-mile range. Separately calculating costs for these ranges would not change the outcome of the cost projections if the assumption remains that the number of vehicles will average out to yield a 300-mile nominal range. Staff also modeled that a portion of the BEVs in each vehicle class segment would have even longer range, with a 400-mile nominal range covering applications from the mid-300-mile range to over 400 miles as some already offer. This was done in consideration of needing to appeal to a broader base of vehicle purchasers with far greater variance in their expectations and driving needs, real or perceived, that would make them reluctant to purchase a lower-range vehicle. Additionally, given the expectation of some amount of degradation in the vehicle range as it ages, this range assumption increases the likelihood that these BEVs will be able to satisfy the vast majority of used car purchasers' driving needs and demands.

Further, the newly adopted requirements allow manufacturers to certify BEVs as low as 150-mile range and still earn vehicle values to meet their obligations, so to the extent the market exists for such vehicles, manufacturers will be able to bring such products to market. Manufacturers can also certify BEVs for sale that are even less than 150 miles although they would not earn vehicle values towards their ZEV obligation. That said, however, the median range of new BEVs has been steadily increasing and is already near the 300-mile mark. Sales of newly introduced or legacy low-range vehicles like the Mazda MX-30 or low range Nissan Leaf options have had limited success in sustaining or increasing market share suggesting that such low range options may have very limited application. Should the market reverse this trend and show increased interest in lower range applications, staff will be tracking industry's progress and, if warranted, can bring proposed regulatory revisions for CARB to consider at a future time.

2. Comment: Commenter states to 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. The U.S. Department of Energy (DOE) reports that both maximum and median range of Evs continued to increase through 2020. 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."Raising the proposed minimum range is supported by consumer evidence suggesting greater EV adoption is supported by longer range Evs. 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. 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. [OP-78]

Agency Response: CARB assessed this commenters suggestion to raise the minimum range requirement beyond 200 miles, and did not modify the regulation. While staff agrees with the commenter that recent trends are pushing the median and minimum range higher, staff does not agree that the minimum range required by the regulation needs to be at the leading edge of what manufacturers are offering. As the industry prepares to introduce a far broader spectrum of vehicle models covering the full range of price points and vehicle types, it is expected that some manufacturers may have limited offerings at the lower end of the range to target commuter type vehicles or smaller, lower price point vehicles where long range is not as high of a priority with the intended consumer. Whether manufacturers can successfully sell any significant volume of vehicles with a sub-200 mile range is unknown and perhaps even unlikely given the market research that continually shows minimum range is a key factor in a purchase decision but if such a market segment exists for some manufacturers, the regulation provides the flexibility for an increased likelihood of transition to a predominantly ZEV fleet as early as possible. Further, with the ZEV assurance measures, even lower-range vehicles will have increased transparency to the purchaser in terms of expected warranty coverage, durability, and ability to read the battery state of health as it degrades providing for a more informed consumer decision should they find a lower-range vehicle that meets their needs.

Regarding the comment that raising of the minimum range would obviate the need for a durability standard, staff disagrees. Increased initial range comes with an increased initial price and it is unreasonable to think that consumers that elect to pay for the added range would be perfectly content to have such extra range rapidly degrade just because it can still drive a 'sufficient' number of miles. The consumer electing to purchase the longer range has a need, real or perceived, to make use of that longer range and to suggest that they really would still be fine if they lost a significant portion of that in the first 8 or 10 years is illogical. Consumers need to have assurance that they are getting what they paid for and a durability standard that ensures they will continue to get a high percentage of what they started with is a more appropriate structure that aligns with consumer expectations rather than a structure that allows much higher degradation just because the vehicle started out with more range.

3. Comment: Commenter appreciates that CARB will allow for the certification of ZEVs with a range less than 200 miles provided that the vehicles meet all of the ZEV quality assurance measures, but would like to confirm, whether CARB's intent here is for this allowance to apply only for vehicle certification purposes but not for credit earning purposes. [15-17]

Agency Response: CARB confirms that the allowance created in the final proposal provides for certification of ZEVs with less than 200 miles but does not provide any allowance for such vehicles to earn vehicle values to be used towards a manufacturer's minimum obligation under the ZEV regulation. To the extent that lower-range ZEVs can be successfully introduced to the market by manufacturers, this allowance will ensure that the ZEV regulation is not an unnecessary hindrance. However, consistent with the stated intent of the ZEV assurance measures to increase the likelihood of a successful transition to a predominantly ZEV light-duty vehicle fleet and ensure the emission benefits of the proposal are realized, it will be important even for shorter range ZEVs to be durable and usable such that initial (and subsequent) vehicle owners have a satisfactory experience with the vehicle.

E. Data Standardization and Battery State of Health

1. Comment: The Automakers support plans to provide EV customers with real-time information on battery state-of-health, with benefit to both customers and the used-vehicle market. [OP-148]

   Agency Response: CARB appreciates the acknowledgement and support by manufacturers for a requirement that will likely benefit the used car market more than the new car market. CARB adopted the final Advanced Clean Cars II regulations at its August 25, 2022, hearing.

2. Comment: MBAG argues standardized data stream requirements should not be required, thereby eliminating the need for in use testing. [OP-120, 15-17]

   Comment: CARB is proposing all new requirements for a standardized data communication protocol, fault code reporting, data stream, state of health monitor, and the state of health display in the instrument cluster via 13 CCR §1962.5 Data Standardization for ZEVs. Meeting the requirements applies not only to the ability to earn credits, but to sell these ZEV vehicles in CA or the Section 177 states. MBAG contests CARB's authority to require that ZEV vehicles that have no emissions must meet ACC II ZEV requirements as a condition for certification and sale. We maintain that if an automaker is already in compliance with its ZEV sales requirements, it should not be prohibited by CARB from selling additional BEVs simply because they do not adhere to (for example) the communication protocol requirement. [OP-120, 15-17]

   Comment: Commenter asks CARB to rethink the data standardization requirements to strike a balance between the goals of the requirement and cost to implement it [OP-124]

   Comment: Commenter requests flexibility in providing data stream requirements. Commenter says they may not be able to sell their vehicles in California without the data standardization requirements. Lead time is essential and financial investment is crucial. Commenter says more than a two-year lead time is needed to update their products, specifically for new EV protocols and new fault code reporting. [T1-14, B1-35]

   Comment: Allow certification without credits for the duration of ACC II: CARB should ensure vehicles conceptualized and developed prior to ACC II have a pathway to stay in the market. This option would be utilized sparingly to keep small volume vehicles,

which do not have refresh plans in the near term, in the market. BEVs which do not meet the listed data stream requirements still provide customers a pathway to transition away from fossil fuel burning technologies, thus supporting the long-term goal of environmental protection. Moreover, if the standardized data stream and warranty provisions are of significant importance to the customer, ample vehicles will still be available in the market for customers to purchase as this pathway will not generate credits for fleet average compliance. [OP-120, 15-17]

Comment: In addition to the unrealistic implementation timeframe for the proposed Data Standardization requirements, MBAG believes establishing these requirements as a condition for sale over-emphasize their relevance relative to the absolute environmental benefit that any ZEV (with or without Data Standardization) provides. Such impacts are clearly inimical to the regulation's goals. [OP-120, 15-17]

Comment: We reiterate our request for flexibility under the data standardization requirements. In our previous comments, and as recognized by CARB at the June meeting, the requirement may unnecessarily limit the ability for ZEVs to be sold in this state. We suggest the addition of an option to certify vehicles without earning ZEV credits when they have met assurance measures, other than data standardization. This option would provide an important transition for vehicles launching in the near future. And won't be updated prior to the implementation of the data standardization requirements. [T2-8, B2-6]

Agency Response: CARB considered this commenter's request to not require data stream requirements, or to still allow vehicles not able to meet these requirement to earn ZEV values under section 1962.4, and did not modify its proposal.

See response to Comment C-14 in FSOR Appendix A regarding CARB's broad authority to regulate vehicle emissions, as well as response to Comment B-1 above. See also ISOR Sections II and III.B as to the need to require ZEVs to meet California's clean air and GHG goals, and ISOR Section III.D.1 and Appendix F-7 for the need for data standardization and access to data and for why data standardization is a necessary element to increase the likelihood of ensuring emissions are reduced. The ACC II regulations establish emission standards and related requirements (including data standardization) to ensure the vehicles reliably and consistently meet those standards in a verifiable manner, which manufacturers certify they meet.

The intent of the ZEV assurance measures, including data standardization, is to address consumer challenges and increase the likelihood that consumers have successful experiences with ZEVs and to avoid situations where some aspect of the experience dissuades that consumer or other consumers from purchasing ZEVs in the future. As explained in Appendix F-7 to the ISOR, CARB, vehicle technicians, and vehicle owners necessarily need easy access to certain vehicle data in order to monitor and assess whether ZEVs are actually meeting these assurance measures, and that data must be in understandable and uniform formatting (i.e., standardized) so that it is readily comprehensible and comparable across all ZEVs. Lack of data standardization increases the chance that such a vehicle will not be able to be serviced by independent repair facilities which in turn will provide a negative experience for second or later vehicle owners that commonly rely on such service providers at lower

cost than the manufacturer's franchised dealer service facilities. Further, data standardization includes the ability of the consumer to read the battery SOH and the charging speed, and lack of both of those features will undermine the increased transparency needed to improve the charging experience and properly value vehicles during used car transactions. The pace at which a successful transition to a predominantly ZEV fleet is needed can ill-afford any setbacks from consumers having less than satisfactory experiences when they transition to a ZEV. In other words, the standardized data and data communication requirements of section 1962.5 are essential to ACC II, without which it would be impossible to ensure ZEVs are operating as intended and required to meet the proposal's emission reductions goals.

A manufacturer selling a mix of ZEVs that meet the requirements and those that do not, even if those that do not are a minority of the ZEVs being sold, directly undermines the intent of the assurance measures and increases the risk of an unsuccessful transition to a ZEV fleet. A subset of future ZEVs that use a unique and proprietary protocol and format to access data for service and repair are less likely to be able to meet the needs of purchasers of used ZEVs who routinely use non-franchised independent service and repair facilities to maintain and repair older, used vehicles. To the extent these vehicles represent a small number of vehicles to begin with and a diminishing market share as fully compliant vehicles are phased in, the problem is even further exacerbated. Tool manufacturers and repair technicians will have lower market demand for these tools thereby increasing the per tool cost to develop and purchase such tools which in turn, will result in higher service and repair prices that must be charged to consumers of these vehicles to recoup the higher tooling investment.

CARB disagrees with the commenter's characterization that the ZEV data parameters will require a significant amount of investment from manufacturers. The primary protocol option to comply is identical to that required for all conventional vehicles, and industry and CARB staff have been working for many years on those requirements. Most ZEVs produced by traditional manufacturers indeed utilized that same protocol and structure and will be able to continue to do so. The second option, added only for ZEVs, provides a level of flexibility not offered to manufacturers for conventional vehicles and includes the allowance of a newly applied ethernet protocol with the same message structure as conventional vehicles.

3. Comment: The SOH requirement is phased in with 40 percent meeting the requirement in 2026MY and 100 percent by 2027MY. The warranty requirements in 13 CCR 1962.8 for the battery appears to be based on the SOH in this section. We understand that for 2026MY vehicles that have not phased into this regulation 1962.5, the SOH evaluation would be based on a manufacturer defined procedure. [15-24]

   Agency Response: CARB agrees with the commenter that the data standardization requirements of title 13, CCR section 1962.5 are phased in including the requirements to both make a standardized SOH parameter readable to a scan tool and to make the parameter viewable in car without the use of tools. The adopted ZEV warranty requirements of title 13, CCR section 1962.8 utilize SOH as calculated for the standardized data parameter as the performance criteria for determining when a warrantable condition exists for the battery for all 2026 and subsequent MY ZEVs and

PHEVs, including those that are not part of the data standardization phase-in. For vehicles not yet phased in, the consumer will be at a significant disadvantage in pursuing a warranty claim relative to vehicles that are part of the phase-in because they will be unable to independently verify the current SOH of the battery. This is identical to the situation that exists on virtually every ZEV and PHEV in production today and likely will stay that way through 2025 MY. In these cases, manufacturers have a stated warranty performance criteria (typically 70% SOH) and utilize vehicle manufacturer-specific procedures and tools to read that value from the vehicle or to subject the vehicle to a charge and discharge procedure to establish the current state of health. The same would be expected for the last of these vehicles in the 2026 MY before being phased-in to the data standardization requirements with the exception that the SOH value determined by the manufacturer-defined procedures will need to represent the health relative to the remaining usable battery energy, given the warranty requirements in section 1962.8, rather than some other battery characteristic that a manufacturer could be using today for its voluntary warranty policy.

4. Comment: Extend Phase-In until MY2030: A second alternative to prevent accelerated vehicle refresh timings which will drive up costs for the end consumer is extending the permitted phase-in to MY2030. The implementation of a gradual transition over 5-year period ensures that, for any vehicle introduced to the market prior to ACC II which follows the standard 6-year life cycle, manufacturers will not have the Hobson's Choice of deciding between a costly mid-lifecycle update to comply with Data Standardization requirements, or withdrawing a viable Zero Emissions option due to non-compliance of mandatory certification requirements which have no influence on greenhouse gas or criteria pollutant reduction. [OP-120, 15-17]

   Comment: This phase-in ignores the standard cadence of vehicle refreshes. The standard vehicle life is approximately 6 years, and so a vehicle intended for market introduction in MY2024 may be scheduled to be sold through MY2030. With the introduction of Data Stream requirements, even if there is a 2-year phase-in, manufacturers must choose between pulling ahead a life-cycle update to comply with the new regulations (which may prevent development of new product and increase vehicle costs as there are fewer years to amortize the development costs) or completely withdraw a ZEV from the market in MY2027 if it does not meet supplemental requirements which do nothing to directly impact climate change. [OP-120, 15-17]

   Comment: Commenter asks that CARB consider extending the phase-in until model year 2030. [B1-35]

   Agency Response: CARB considered this commenters' request to extend the phase-in for vehicles to ZEV data requirements included in the ACC II regulations and did not extend the phase-in for these requirements. The data standardization requirements contain a phase-in that allows for introduction on a portion of 2026, 2027, and 2028 MY vehicles to provide manufacturers with three to five years of lead time to implement instead of the two years cited by the commenter. Further, the requirements allow several distinct paths to meet standardization requirements including identical protocols and methods as allowed for all conventional vehicles and a newer protocol already in-use by several manufacturers. In follow-up discussions

with the commenter, the ZEVs of concern have been represented as using one of these allowed protocols but for some undisclosed reason, the commenter does not believe that its implementation is or can be readily made compliant with adopted requirements. Accordingly, staff proposed no further changes to the requirements or the phase-in as part of the final adopted package. See response to Comment E-2 on CARB's approach to establishing the ZEV data standardization requirements.

CARB acknowledges that a new in 2024 MY product, at the tail end of the ACC I requirements and just before the start of the ACC II requirements, may be the worst case for scheduling an update at a regularly scheduled refresh or redesign. However, 2024 MY vehicles are not yet finalized in their software calibration which provides some time for manufacturers to proactively include some of the required changes before initial roll-out. Staff worked with manufacturers for over a year towards the standardization and manufacturers could have chosen approaches that were protective of where the final requirements ended up. Second, a new in 2024 MY product would traditionally undergo a refresh for the 2027 MY, which is provided for in the phase-in of these requirements across a manufacturer's 2026, 2027, and even some 2028 MY vehicles. While manufacturers may prefer to prioritize resources during a refresh to things they believe will have a bigger impact on consumers' willingness to buy the car or to make it look different and new, manufacturers have traditionally used such opportunities to also phase in emission or safety requirements including certifying to lower tailpipe emission standards, adding required on-board diagnostic amendments, or even powertrain or vehicle upgrades to lower a vehicle's GHG emissions. To suggest a manufacturer should be allowed or is typically allowed to continue a vehicle for five or six years without any updates to meet emission standards is inconsistent with past practice in the automotive industry. Further, the rapid advancements in battery technology alone have led to even shorter timelines for refreshes or updates than traditional vehicles, with several manufacturers updating battery packs as often as every two years. Lastly, CARB disagrees with the commenter's characterization that these standardized data requirements have no impact on emissions reductions and have addressed the need for these requirements in the ISOR and preceding responses.

Regarding the characterization of a costly mid-lifecycle update, CARB disagrees with the commenter. Virtually every vehicle has a scheduled mid-lifecycle update during which changes to meet the data standardization could be implemented. Further, the changes to meet the minimally required data standardization are very limited in scope and involve reporting specific data parameters and already defined fault codes in accordance with a standardized format. The commenter has already acknowledged it is using a version of Unified Diagnostic Services (UDS) for the format which is what the required standardized data uses. As such, it would be expected that only minor revisions are needed to allow proper response to the defined standardized UDS messages in addition to whatever proprietary messages the commenter has already implemented. When asked for further clarification as to the level of work that would be involved in making such a change, the commenter was unable to provide such information prior to adoption of the requirements and still has not yet provided a response.

5. Comment: To ease manufacturer concerns related to the data stream requirements, CARB drafted a 2-year phase-in proposal which culminates in all vehicles meeting this requirement in MY2027 or MY2028 depending on if the standard or the manufacturer-defined phase-ins are utilized. In the Purpose and Rationale documents, CARB acknowledges this phase-in is "necessary and reasonable to allow manufacturers to spread the burden of bringing all [vehicles] into compliance with these requirements." MBAG posits that the 2-year phase-in is not a "reasonable" timeframe to comply with these new data standardization requirements. [OP-120, 15-17]

   Agency Response: The two (or three if using an alternative phase in) year phase-in of the requirements over the 2026 through 2028 MYs comes after an initial three years of lead time from today until the 2026 MY. Three years of lead time is consistent with decades of adopted new requirements by CARB and even typically used by the U.S. EPA. Given traditionally that most vehicles are subject to refreshed designs every three years and all new designs every five to six, a new requirement starting three to five years out is both reasonable and fairly flexible to allow manufacturers to implement changes at a normally scheduled redesign for the vast majority of vehicles. Further, staff have been working with industry and SAE, which is comprised of the vehicle manufacturers' representatives, to develop the ZEV standardized data for over a year leading up to the point of adoption providing even more advance notification of the upcoming changes. And, had the commenter chosen to implement a protocol and format consistent with that already required on every one of its gasoline, diesel, and PHEVs, the commenter would already be on track to comply. However, even while staff and industry were working to agree on standards, the commenter chose to depart from standard practice and go forward with plans to roll out a unique proprietary message format for brand new developed ZEVs. See response to Comment E-2 for CARB's approach to establishing the ZEV data standardization requirements and responses to Comment E-3 and E-4 about establishing the phase-in for such requirements.

6. Comment: Commenter states that we also need to get EV manufacturers to publish typical and maximum charge times from 10% to 80% SoC at various temperatures – at least at 10°F, 30°F, 50°F, 70°F, and 90°F. [OP-90]

   Agency Response: CARB considered this commenter's suggestiong to increase transparency to consumers in the capability of the ZEV so that they can make a more informed purchase decision. However, labeling and disclosure requirements must also consider how to condense and standardize such information to make it readily understandable and comparable across manufacturers and models. Regarding charging times, staff is aware of ongoing work in an SAE J2953-4 workgroup to develop test procedures and standardized test conditions to quantify vehicle charging capability under various conditions with the intent of being able to better inform the customer in a consistent manner. As with many elements of the ACC II regulations, staff will continue to monitor the progress of this workgroup and others and will consider further labeling or disclosure requirements during future rulemaking revisions.

7. Comment: Commenter suggests that the option to certify vehicles without earning ZEV credits when they have met all data assurance measures other than the data standardization requirement should be added. [15-17]

   Agency Response: CARB considered this commenter's request to certify vehicles that do not meet the ZEV data requirements included in the ACC II regulations. CARB disagrees with the commenter and did not make such a change to the final adopted regulations. See response to Comment E-2 for CARB's assessment of the importance of standardized data requirements for ZEVs.

8. Comment: Commenter asks that CARB should consider allowing credit generation with Executive Officer approval of an alternative data stream proposal. [B1-35]

   Comment: Permit generation of credits with Executive Officer approval of alternative data stream proposal: A final option would be a structured pathway to Executive Officer approval for vehicles which deviate from the requirements set forth in 13 CCR §1962.5. Manufacturers should be able to propose alternative approaches to supporting 3rd party reparability such as making manufacturer specific enhanced scan tools which can readout the required information and service information readily available for purchase. With Executive Officer discretion, a vehicle's viability and certifiability can be evaluated allowing maximum flexibility to bring vehicles to market and ensure manufacturer fleet averages are met. [OP-120, 15-17]

   Agency Response: The data standardization requirements are intended to provide exactly that—standardized data that can be consistently accessed and used by CARB, the repair industry, or other users. Adding more permutations of the 'standard' used to access the data directly contradicts the purpose of having a standard in terms of minimizing costs and resources to toolmakers and, ultimately, to those that purchase the tools to be able to communicate with the vehicle. That said, the ZEV data standardization requirements have departed from the rigor of what is allowed for conventional gasoline vehicles where all vehicles must use the identical protocol and messages to report the required information. For ZEVs, an alternate pathway was created to allow a manufacturer to choose between one of two different protocols to be used based on several manufacturers already having this alternate protocol on current and planned vehicles. This provides more flexibility than is allowed for conventional gasoline vehicles and was done so with careful consideration on the impact to tool manufacturers and repair technicians that purchase such tools. Including further options, especially ones intended to be used by only one manufacturer and only for a limited time on a few small-volume legacy vehicles, requires an exponential amount of resources by the tool industry and the repair industry to develop, validate, and purchase such capability with a very small volume of vehicles to generate future repairs to offset such costs. For these reasons, CARB did not make this change.

9. Comment: As proposed, the definition of high voltage battery pack SOH in consideration of energy reserve, as specified under (c)(4)(A)4.d., is ambiguous and open to interpretation based on use of the wording "normalized such that 100 percent reflects the usable battery energy as if the user was allowed to initially access the maximum the system is designed to ever allow". Since SOH is an important value to

the customer and to the proposed body of regulations and it has enforcement and warranty implications, Rivian asks that CARB directly define the calculation in cases of reserve capacity. In Rivian's view, this definition should consider reserve capacity in both the numerator and denominator and bound the SOH at 100% such that it will always result in a beginning life value of 100%. [OP-127]

Comment: Commenter asks that CARB directly define the calculation in cases of reserve capacity. In Rivian's view, this definition should consider reserve capacity in both the numerator and denominator and bound the SOH at 100% such that it will always result in a beginning life value of 100%. We propose the following definition:

$$SOH_{yrX} = \frac{Capacity\ Measured + (Reserve_{total} - Reserve_{unreleased})}{Certified\ Capacity + (Reserve_{total} - Reserve_{unreleased})}$$

[B1-10]

Agency Response: CARB disagrees with the commenter that the newly adopted requirement for battery SOH calcuation is ambiguous in its adopted form. It provides explicit direction to manufacturers to require them to account for all of the reserve usable battery energy in the calculation of the state of health, and the associated in-use compliance regulation (section 1962.7) also provides direction on how CARB will test vehicles to verify the state of health accuracy. To the extent that the commenter is looking for details such as the configuration of literal bits and bytes in the messages to report state of health in a standardized parameter, such details are contained in the incorporated SAE standards, which are incorporated by reference into the ACC II regulations.

10. Comment: Commenter recommends CARB amend the ACCII regulations to require a state-of-health metric that can be read both through the vehicle and directly from the battery if the battery pack is removed from the vehicle. [OP-172]

Agency Response: Substantial technical issues arise if the requirement were to include a provision for the battery pack, or a subset of the pack, to be able to report an SOH parameter once removed from a vehicle. The calculations for such a parameter are done within electronic control units—on-board computers—on the vehicle that are monitoring and measuring various characteristics of the battery during different driving and charging conditions. Such on-board computers are not typically embedded in the battery pack nor replaced when a battery pack is replaced or rebuilt in part or in whole. Accordingly, adoption of such a requirement would entail substantial additional cost to ensure a control unit capable of storing and communicating a calculated SOH parameter would be permanently affixed to each replaceable portion of a battery pack. Staff understands the desire for battery repurposers or rebuilders to be able to read such data directly from whatever pack or portion of a pack they happen to get in order to more quickly determine the potential value of a used battery, but the typical architecture of a battery pack today does not support such a requirement. Further, the volume of used batteries for which such a capability would be of value is highly uncertain as more and more data suggest that the original battery will typically last the life of the vehicle and it may then go straight

to recycling rather than spending a portion of time in a secondary application. Nonetheless, as part of staff's ongoing monitoring and tracking of industry and technology progress, should the need arise for a mechanism to better disclose or keep track of battery SOH as packs or portions of packs are removed, staff will revisit the feasibility and costs of such a proposal.

11. Comment: Commenter states that the data standardization regulation should only apply to vehicles that receive ZEV or PHEV credit. Thus, in section 1962.5(a), commenter recommends adding the phrase, "to earn vehicle values in accordance with title 13, CCR, section 1962.4." The sentence would then become, "The requirements of this section shall apply to light-duty zero emission vehicles (ZEV) and plug-in hybrid electric vehicles (PHEV) certified to earn vehicle values in accordance with title 13, CCR, section 1962.4 for sale in California as follows:". Commenter states that, with this addition in subsection (a), the same text ("to earn vehicle values in accordance with title 13, CCR, section 1962.4") should then be deleted from subsection (a)(2) since it is not necessary. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

    Agency Response: Directionally, CARB agrees and adopted language which clarifies that only PHEVs certified to earn vehicle values were required to meet the portion of the data standardization that applies to PHEVs. As a reminder, PHEVs not certified to earn such values would continue to still be subject to a separate set of data standardization requirements per the on-board diagnostics requirements of title 13, CCR, section 1968.2. For ZEVs, on the other hand, all vehicles are required to support the standardized data to be certified for sale in California as these newly adopted provisions are the only standardized data requirements that apply to ZEVs and access to such data is needed to support the other ZEV assurance measures such as independent repair shop access to service information and CARB access to data regarding in-use vehicle performance relative to the certification test procedures and standards.

12. Comment: Commenter refers to Section 1962.5(c)(4)(A)4d, Standardized Requirements, SOH for Vehicles with battery reserve. Commenter states that this provision requires the SOH monitor to report the full range of battery capacity that the vehicle will ever allow and ignore the battery reserve. Commenter states that the need for a battery reserve is largely driven by CARB's durability requirements. Commenter states, however, that the SOH is used for battery warranty. Commenter states that thus, manufacturers face competing requirements of adding battery reserve to meet the durability and then being penalized for that addition through the combination of SOH monitor in this regulation and the warranty in that regulation. Commenter recommends revising this paragraph to add the word "maximum" and the phrase, "at the time of certification (e.g., a vehicle with a new battery but without the reserve capacity)." Commenter also recommends deleting the language, "as if the user was allowed to initially access the maximum the system is designed to every allow (e.g., a vehicle with a new battery but with the reserve in the system artificially opened up to its maximum range of authority)." Thus, commenter proposes revising the text to read as follows: "reflects the maximum usable battery energy at the time of certification (e.g., a vehicle with a new battery but without the reserve capacity). Upon

Request by the Executive Officer, the manufacturer shall provide software or other means for CARB to conduct verification testing to ensure the accuracy of the SOH parameter to the measured useable battery energy." [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

Comment: We recommend continued work regarding an improved calculation method that best reflects how manufacturers are designing and deploying the battery capacity for consumer benefits within its data reporting requirements of 1962.5 (Appendix A-6). We recommend CARB allow automakers discretion regarding the increasing battery capacity over the vehicle lifetime as work is done toward greater clarity regarding the associated measurement of battery state-of-health. [OP-98]

Agency Response: CARB disagrees with the suggested changes by the commenter as they would directly undermine the credibility of the reported SOH parameter. Under the commenter's proposal, despite the battery health and ability to store usable energy being degraded, the manufacturer would be able to report to the consumer that the battery was still perfectly healthy at 100% and hadn't degraded at all. In fact, if the manufacturer opened up reserve energy storage at a faster rate than degradation was occurring, the system could even report that the battery health had improved to a value of even greater than 100% all while the battery unquestionably was degrading in its ability to store usable energy. The intent of the requirement is to provide transparency to consumers about the state of health and this means accurately reporting the true state of degradation, regardless of whether the manufacturer has already allowed the consumer to utilize the full extent of the battery storage or is still holding some amount in reserve. While battery degradation is expected to be fairly slow for the majority of a vehicle's life, at some point below 60% and before reaching 40% SOH, the rate of degradation is expected to change to a very rapid rate of decline until it becomes unusable. If a manufacturer were allowed to falsely report a battery was still at 100% while it was opening up reserve, the customer would be unaware of the amount of degradation that had already occurred and could experience a battery that reports 100% for a long period of time and then unpredictably, rapidly begins to decline once all of the reserve has been used up. This would also render the parameter unusable to value used ZEVs differently based on their battery SOH except in cases where the battery was so degraded that the manufacturer had already used up all of the reserve. Thus, the requirements as adopted will prevent a manufacturer from masking degradation from the consumer and avoiding warranty risk by falsely reporting higher than actual SOH by holding some energy in reserve. Manufacturers can still implement such a reserve strategy and provide a slower loss of electric driving range to the consumer, but that will not alter their obligations to report actual decline of SOH or to honor the warranty based on the actual SOH.

13. Comment: Commenter remains concerned that the Battery State of Health Parameter Accuracy delta between the measurement precision available in the lab and in-vehicle customer reported values may exceed 8%. [15-30]

Agency Response: In discussions with manufacturers, staff determined that it was feasible for manufacturers to calculate a value for battery SOH within a few

percentage points of the actual value that would be determined during a laboratory test. However, the accuracy of this calculation varied based on the type of driving (battery discharge) and charging operation of the vehicle where, directionally, larger discharge and charge events facilitated a more accurate calculation. To address this issue, staff established a minimum accuracy of + 5% (meaning the reported value can underreport but cannot overreport the actual SOH by more than 5%). Additionally, staff provided for manufacturers to be able to wait to update their calculated value until they have a higher quality discharge or charge event—thereby providing relief for periods of operation where only short drive events or minimal charge events occur. Further, this relief allows for manufacturers to design to ensure updates occur at least once every 4,000 miles of operation for vehicles, on average. This provides even more protection for manufacturers for individual vehicles or drivers that have usage patterns that are not conducive to accurate SOH calculations. Lastly, for the first few years of this requirement, the in-use compliance regulations explicitly provide that a finding of noncompliance will not be made unless they report an SOH exceeding 8% of the actual value on a significant portion of vehicles in the test sample. This provides additional margin for compliance as manufacturers refine their calculation methods and gain experience on the types and frequency of operation needed to maintain an accurate value.

14. Comment: Commenter refers to Section 1962.5(c)(3), Communications to a scan tool. This section requires manufacturers to "use one of the following standardized protocols for communication to a scan tool of all required messages." Commenter suggests adding the statement, "Only one protocol per vehicle shall be used to report all required messages." Commenter says automakers understand that CARB does not wish for manufacturers to have multiple buses used to meet their standardization requirements. Within the protocol detection, a standardized message will be broadcast by the tool, asking if that bus supports "Regulated UDS" (0x01). Commenter says industry is interpreting that this requirement demands that only ONE bus, Ethernet OR CAN, is permitted to respond positively to this request. Regular/enhanced UDS diagnostic messages can and may be supported on both buses (if available) to support accessibility of diagnostic data to as many tools as possible (older CAN tools and modern Ethernet tools). Commenter says that during Auto Innovators meeting with CARB staff on 10 May 2022, CARB indicated that their expectation was in alignment with this interpretation of the language. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

    Agency Response: Staff agrees with the interpretation by the commenter based on our understanding of the current standardization structure. That is, a dedicated message is to be used by external tools to first query a vehicle as to which protocol it supports, each vehicle will be designed to positively respond to that message with the one and only protocol that all required data will be available through, and that the manufacturer will be liable for compliance to the standards. Should a tool bypass this command or ignore the response and attempt to communicate on a different protocol, a vehicle is allowed to not respond or to have only some of the required responses or even to have a complete response. Based on that understanding, staff agrees with the interpretation by the commenter because it will allow for an external

tool to positively identify the one protocol that it should use to reliably access all required information.

15. Comment: [1962.5] (c)(4)(D)1.r. Battery Temperature History The J1979 team is working to provide standardized data to enable assessment on the temperature history of a ZEV energy storage system. Within CARB's request for standardization, CARB specifically suggests in the standardization regulation that the temperature data is adjusted for energy throughput. To simplify the data across manufacturers, we recommend removing that constraint as shown here: "r. Average battery temperature during charging and propulsion system active. [remove following text] weighted by battery energy throughput." [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

    Agency Response: After further discussion with the SAE committee members and commenter, staff agrees with commenter's suggestion and modified the language before it was adopted by CARB to reflect this change.

16. Comment: Rivian questions the use case behind generating cumulative battery system current at 1 second intervals, as requested/required by proposed language in 1962.5(c)(4)(A). While we recognize that this requirement was tied to PEMS data collection, the use case does not exist for EVs. In the case of range testing, there is no real need to poll this data throughout the test at one second intervals, as it suffices to take a read at the beginning and end of the cycle. For these reasons, Rivian asks that CARB reconsider the need for continuous current reporting additional to the cumulative report. [OP-127, B1-10]

    Agency Response: For the final adopted package, no further changes were made as a result of this comment and both the continuous and cumulative current parameters are required. These parameters were created with the help of personnel experienced in laboratory testing of ZEVs and the type of data routinely needed to conduct official tests for certification. That said, staff will continue to work with the SAE committee and industry as more testing experience is gained over the next several years and, if further changes are warranted, can propose such changes during a future regulatory revision.

17. Comment: We notice what appear to be typos as follows: ¬ (c)(6)(A) and (c)(6)(B): there appears to be an extra "(c)(4)" in the text. ¬ (e)(4)(D)1.: This should reference (e)(4) rather than "(e)(3)." [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

    Agency Response: Staff thanks the commenter for the thorough review and indeed the commenter identified a formatting issue that resulted in mistaken old and new section references. These typographical errors were corrected in the final adopted version of the ACC II regulations.

18. Comment: Rivian seeks verification that CARB will allow use of the latest revision of the J1979-DA that includes all applicable data. [OP-127, B1-10]

    Agency Response: As has been past practice by CARB in all regulations that reference standards such as SAE standards, each regulation must identify the specific version of

the standard that it is incorporating at the time the regulation is adopted. As part of routine regulatory updates that happen, staff try to ensure that any such external standards references are, where appropriate, updated to the most recent version. However, there is necessarily a lag between when entities like SAE adopt a new version and when CARB has an opportunity in a regulatory update to include such version. In those circumstances, CARB has relied on existing provisions in federal and California test procedures, incorporated into the regulation, that allow manufacturers to request the use of alternate test procedures and the Executive Officer evaluates each request on its merits. In cases where the incorporated SAE standards entail test procedures that fall within this provision, the manufacturer may request use of the updated test procedures and the Executive Officer will review and consider approval on a case-by-case basis.

19. Comment: Industry has been working with CARB to provide a standard (J1979-3) that allows access to diagnostic data over CAN or Ethernet. J1979-3 requires updates to J2534 to allow for usage of ethernet for communication. It is recommended that CARB update their references to J2534 to allow for programming over ethernet as well. Such a change will improve the efficiency of the repair community by allowing for much faster reprogramming for ZEV owners. SAE J2534-1 was updated on October 28, 2015. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

    Agency Response: Staff agrees with the commenter and made appropriate updates to the incorporated SAE J2534 standards during the First 15-Day Noticeprior to adoption of the final requirements.

20. Comment: In the interest of clarity, Rivian believes that there should be explicit references to the most relevant standards whenever possible. To that end, we ask CARB to directly incorporate by reference the following: SAE J2534-2, for incorporation of Diagnostics over Internet Protocol ("DoIP"); The balloted version of SAE J1979-3, which went out for ballot on 28 April 2022; [and] SAE J1979-DA. [OP-127, B1-10]

    Agency Response: Staff did make modifications to title 13, CCR section 1969, as part of the First15-Day Notice to specifically incorporate J2534-2. Additionally, changes were made to update the version of J1979-3 in title 13, CCR section 1962.5 to the most recent available version at the time of the rulemaking. However, the balloted version mentioned by the commenter was not completed or available until after the rulemaking was concluded and thus could not be used as the version incorporated in the regulation. Also, for section 1962.5, the regulation only incorporates SAE J1979-3 and does not directly incorporate any of the J2534 standards or the J1979-DA as those are already referenced and incorporated into the J1979-3 document itself. Staff will continue to work with the SAE committees and industry and, as inevitably happens when SAE standards get updated, staff will track such updates and, where appropriate, incorporate amendments to update to the newer versions during future regulatory actions.

21. Comment: To reduce administrative burden, Rivian would appreciate clarification on whether OTA related data reporting is required in cases where the relevant cumulative

values are saved prior to the reprogramming and written back into the onboard data system upon update completion. This "inhale, exhale" approach to ensuring that key indicators do not reset at every OTA update may provide a desirable compliance pathway if it would suffice for CARB's purposes. Rivian seeks clarification on whether saving and reassigning the cumulative metric values sufficiently honors the spirit of this regulation or if the full reports would be required upon each system update regardless. [OP-127, B1-10]

Agency Response: Staff intended for this requirement to capture data and report it to CARB in conjunction with an over the air (OTA) reprogramming event because of the likelihood that such data would be otherwise lost upon such an event and undermine the value of the data required to be collected cumulatively. This is consistent with the requirements of on-board diagnostic systems in title 13, CCR section 1968.2(g)(8.1) where such data collection and reporting is only required in instances where such data would be erased or otherwise lost during the OTA event. Accordingly, staff agrees with the commenters that the data collection and reporting for ZEVs would likewise only be needed if such data were to be lost during the OTA event and strategies that preserve such data in the vehicle would be acceptable alternatives to avoid the need to collect and report the data to CARB.

22. Comment: Subsection (a) applicability could be read to require all PHEVs to meet this requirement. However, subsection (a)(2) makes it clear that this requirement only applies to "PHEVs certified to earn vehicle values in accordance with title 13, CCR, section 1962.4." This reading is also reasonable since the only path to this regulation is through 13 CCR 1962.4 and non-credit- generating PHEVs would certify to 13 CCR 1961.4. While this is the only reasonable reading of this regulation, we recommend revising the applicability section (a)(2) as shown below for clarity. [15-24]

    Agency Response: CARB concurred with the commenter and have made a non-substantive change to the cited language to better ensure stakeholders and regulated parties will have confidence they have correctly understood the requirement.

23. Comment: In section 1962.7, CARB specifies "The collected data from each vehicle shall include: … (C) All applicable standardized data specified in CCR, title 13, section 1962.5, including(c), such as battery state of health (SOH)." While the section refers to what is included in CCR, title 13, section 1962, MBAG believes that the language as written does not provide clear guidance on what is expected from OEMs for data submissions. MBAG believes that CARB's intentions were that this would be "vehicle tracking data" rather than "standardized data" and would appreciate further clarification in the form of regulatory language and/or language in the final statement of reasons. [15-17]

    Agency Response: The reference to title 13, CCR, section 1962.5(c) is accurate in that all the standardized data required by section 1962.5 is specified within subsection (c). While the individual data elements are called out in more detail within subsection (c)(4)(A) through (D), reference to the overall subsection (c) was intended to provide greater clarity to manufacturers as subsections (c)(1) through (c)(3) identify the standardization requirements for the data elements leaving no room for misinterpretation as to which data elements were required to be collected and

reported from test vehicles. While the vehicle tracking data mentioned by commenter is within subsection (c)(4)(D) only, the other data elements of subsection (c)(4) are valuable information that can be used to verify the robustness of the data and the software version of the test vehicles.

24. Comment: 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. 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. [OP-78]

    Agency Response: Staff has worked closely with the relevant SAE committees in developing an alternative protocol option that better aligns with some manufacturer's ZEV products while still protecting for reliable and predictable access for repair technicians and tool manufacturers. To that end, SAE has worked on updates to SAE J1962 to ensure that a future version can be used for the alternative ethernet protocol option that was added in J1979-3 and, by reference, to the data standardization requirements for ZEVs. Staff will continue working with SAE and industry, which is the predominant participant in the committees, to ensure that any future versions, which would be adopted via regulatory amendments as appropriate, are both backward- and forward-compatible to the extent they can be.

25. Comment: 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. 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. More specifically, Tesla strongly supports CARB providing the flexibility to utilize diagnostic over IP (DoIP) capabilities. 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.). [OP-78]

    Comment: Tesla recommends CARB ensure that other devices can be installed in a BEV, including, but not limited to, a RJ45 connector 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. [OP-78]

Agency Response: In the final adopted requirements, CARB did provide for two paths for manufacturers to meet the standardization portion of the requirements. In addition to the controller area network (CAN) path that all conventional gasoline vehicles are required to use, CARB provided an alternate path to use the requested DoIP structure reliant on the ethernet or IP protocol. However, in working with industry including tool makers, manufacturers, and the repair community, the decision was made to stick with the existing SAE J1962 diagnostic connector for access to either protocol rather than opening the door for additional connector shapes or sizes for tool manufacturers and technicians to utilize. The J1962 connector has a strong position in the automotive industry as a robust connector supported by millions of pieces of equipment worldwide and it had the capability to include support for DoIP within it. Accordingly, CARB did not make changes in the final requirements to allow for use of alternate connectors.

However, in the separate requirements for manufacturers to provide for standardized access to conduct reprogramming events of the propulsion-related on-board computers in ZEVs, CARB did include further options for manufacturers. Unlike access to the standardized data and fault codes, which are more routine tasks conducted by the repair industry as well as other users including CARB, reprogramming of on-board computers is utilized far less frequently in a subset of repairs where updated calibrations or programming is needed as part of the repair. Reprogramming also entails more specialized hardware than that used to access stored data and involves much larger amounts of data to be transferred during the process. Accordingly, the regulation provides for manufacturers to make reprogramming capable with a standardized hardware interface specified through SAE J2534. To best take advantage of the larger data throughput capable in the ethernet protocol and recognizing that the ethernet protocol may allow for commonplace connectors and cabling in today's laptops and electronics such as a standard RJ45 ethernet cable and port or USB connector, further provisions were made for ZEVs to meet the standardized reprogramming requirement. Namely, updates to SAE J2534 that include the use of the ethernet protocol were added to the regulation ensuring such a solution would be allowed. Additionally, a provision was made for manufacturers to comply without the use of a J2534 interface at all if their solution provided for technicians to be able to use a standard personal computer or laptop and commonly available cabling such as a standard ethernet cable and port or USB cable and port to carry out the reprogramming event. With this flexibility, CARB is confident the commenter's concerns have been addressed with various paths that will appropriately balance the desires of the manufacturers for use of newer protocols and higher data transfer rates with the needs of the repair community including tool manufacturers to provide for consistent and affordable tooling.

26. Comment: 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. [OP-78]

Agency Response: The issue of UBE versus capacity as the appropriate metric came up early in the development of the ACC II regulations proposal and was discussed at length during the rulemaking process. Staff continues to disagree with the commenter that capacity is the more appropriate metric to use. In simplified terms, UBE represents the amount of energy the battery can store and can be used to actually drive the vehicle. When the vehicle becomes undriveable, there is still some amount of energy remaining in the battery, but it offers no useful value to consumers. Accordingly, the certification test procedures and establishment of electric range are all anchored to a process that measures how long the vehicle can actually be driven and measures the amount of energy (UBE) that the vehicle consumed up to that point. Capacity, on the other hand, continues to measure all remaining energy that can be removed from the battery with a low power consuming device like a small fan or light bulb. Long after a battery has been depleted such that it cannot provide enough power to drive the vehicle, it can continue to power low consumption devices like an interior dome light or heater fan. Again, however, this extra energy provides nothing meaningful to the consumer regarding the battery's ability to propel the vehicle. Further, the rate of degradation in UBE is known to be faster than the rate of degradation in capacity. Put another way, a battery can retain its ability to store energy to supply very low power demands for much longer than it can store energy sufficient to propel the vehicle. As such, a capacity-based approach would report that less degradation has occurred even though the consumer-facing capability in being able to drive the car has declined. Staff continues to reject this approach as it does not provide for accurate and transparent communication to the driver about the capability of the battery to actually drive the vehicle.

27. Comment: 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. [OP-78]

Agency Response: CARB disagrees with the commenter that the adopted proposal for calculating and reporting battery SOH as a function of usable battery energy is inappropriate or impractical. The provision to calculate SOH allows manufacturers to design their algorithms to wait for opportunistic discharge and charge cycles as long as they can update the data once every 4,000 miles, on average. Further, every manufacturer provides a remaining range estimate on the display to the user much like a gas gauge and estimate of remaining driving range on a conventional vehicle. In order to make this estimate reasonably accurate for consumers and avoid over-estimation, manufacturers are already accounting for the battery degradation in this continually updated consumer-facing display. To suggest the manufacturer cannot separately report this degradation in the form of a battery SOH parameter, with an ability to update it far less frequently than what they are already using for range estimation, is inaccurate.

CARB does not disagree that an even more accurate calculation of battery SOH can be done in a precise off-board format or under well controlled circumstances like laboratory tests. However, these events do not routinely happen in any vehicle's life and involve some form of a complete discharge and full charge events that are time-consuming. The regulatory provisions do not prohibit a manufacturer from also utilizing such a structure to further update their SOH value or as part of a diagnostic or service action where necessary to pinpoint a malfunction or otherwise validate performance of various components. However, allowing a manufacturer to only update the SOH under such circumstances would result in the vast majority of vehicles never having such a test run and never displaying a valid SOH reading. Even for those that did have some occasion to conduct the testing once, it is unlikely it would ever be updated with a second event thereby rendering the reported SOH completely inappropriate for the current state of battery degradation. This approach would completely undermine the intended purpose of providing transparency to the consumer or used car purchaser as to the state of health of the battery—all while the manufacturer separately continues to track and update the calculated degradation on a near real-time basis in order to provide a valid remaining driving range estimate to the consumer.

28. Comment: *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. [OP-78]

    Comment: On-board 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. [OP-78]

Comment: 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. 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.) [OP-78]

Comment: 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. [OP-78]

Comment: 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 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. [OP-78]

Agency Response: See agency responses to Comments E-2, E-12, E-13 , E-16, and E-27 which discuss the feasibility and accuracy of SOH calculations and the allowances for manufacturers to wait for opportunistic charge and discharge events to update such calculations. CARB disagrees that the current structure allows for estimation models that are easily gamed by any OEM to achieve compliance. The data standardization regulation provides for an accuracy, relative to UBE when official laboratory testing is done, and the in-use compliance testing regulation provides for a process to select vehicles, read the reported SOH, then do laboratory testing to determine actual UBE and verify the results are within the allowed accuracy specification. Manufacturers that attempt to over-report the actual state of health would readily be caught and fail such testing. Manufacturers that under-report the actual state of health, on the other hand, would risk eroding consumer confidence by reporting the battery has already deteriorated significantly and risk warranty exposure should the under-reported value reach 70 to 75% in the first 8 years of the vehicle's life.

CARB is expecting that manufacturers will use all available information to provide the most accurate calculation of battery SOH possible including the use of various filters, models, and estimation algorithms. CARB recognizes that the structure of the SOH reporting requirement is such that manufacturers will likely use proprietary algorithms and models to calculate the most accurate value they can. However, this does not alter the manufacturer's obligation to report the SOH within the explicit accuracy (i.e., no more than 5 percentage points higher than actual SOH when measured during laboratory testing) or to provide for updates to the SOH value within the specified interval in the regulation (e.g., at least once every 4,000 miles, on average). This frequency provision is intended to address the exact issue raised by the commenter in that ZEVs rarely are operated in a manner that provides for a perfect complete discharge and charge event and the estimation can be affected by how the battery is being used—thus the allowance for manufacturers to define the type of charge and discharge events that provide higher quality data for the update and to wait for such events to occur in-use.

Additionally, the in-use compliance protocols for evaluating the reported SOH parameter does not require that staff understand or parse out such algorithms or models. The procedure very directly reads the reported SOH value and compares it to the laboratory measurement of usable battery energy made during official dynamometer testing procedures. The complexity of the internal calculations used by the manufacturer to determine what value to report for SOH is irrelevant. Either the reported value agrees within the required 5 percentage points or it does not. Given a sample of several vehicles, the regulation defines how many vehicles in the sample must be outside of this specification to determine a noncompliance irrespective of how much staff do or do not understand about the manufacturer's internal calculations of battery SOH. The same is true regarding warranty claims: there is no need to understand or verify proprietary algorithms used to calculate the SOH value but rather

just to be able to read the SOH value and compare it to the defined threshold for warranty eligibility.

There are no requirements for 'diagnostics' where a manufacturer is required to monitor components or systems for malfunctions and take actions when such a malfunction is identified. The adopted requirements only necessitate that manufacturers calculate a battery SOH and report it, to both a scan tool and directly to the consumer through in vehicle displays. Every manufacturer already does some form of a battery SOH calculation in vehicle and uses it to calculate a remaining driving range value displayed to the consumer. At least one manufacturer, Nissan on its Leaf model, additionally provides a display (in discrete 'bars') of the battery SOH. The feasibility of the ability to calculate an SOH or display such a value on demand by the consumer is not in question.

29. Comment: 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. [OP-78]

    Agency Response: As constructed, manufacturers are allowed to define the conditions under which the calculated SOH parameter will update, as long as it happens, on average, at least once every 4,000 miles. Accordingly, if the commenter elects to use a combination of off-board intrusive charging events as part of its strategy, it can. However, manufacturers are still required to ensure it meets the required frequency for updates, maintains the required accuracy relative to usable battery energy, and is readable by the consumer in vehicle as well as to a scan tool in accordance with the data standardization requirements. And, to the extent manufacturers want to go above and beyond the minimum requirement and report more than just the calculated battery SOH and distance since last updated, such as reporting a running log of the last several calculated values and odometer readings at the time they were made, that is allowed. But the purpose of standardization is to ensure that all vehicles report a minimum set of data in a consistent fashion to consumers as well as scan tool users and as such, a manufacturer would be allowed to report any data it chooses to as long as it is in addition to, not in lieu of, reporting the required minimum standardized data.

30. Comment: CARB's statement that "many of these data parameters are already available" deliberately ignores and obfuscates the fact that the required reporting structure (i.e. the J1979-3, ZEVonUDS, communication protocol) is neither finalized nor even is a similar communication protocol implemented in many ZEVs today. While certain propulsion-related components may meet adjacent requirements (e.g. J1979-1, OBDonCAN) if shared between BEV and PHEVs, CARB's data standardization proposal will require a significant amount of software development for new and BEV specific components which will then necessitate significant lead time and financial investment. [OP-120, 15-17]

Agency Response: At the time the regulatory requirements were adopted, J1979-3 was still in draft format and as such, the draft requirement was adopted as the final requirement. SAE has subsequently finalized the requirement but staff is unaware of any material changes that occurred between the draft and finalized requirement other than added clarifications of the original requirements. Manufacturers are provided lead time to incorporate such changes per the three years prior to the start of implementation and the additional two more MYs in the phase-in after the start. Staff will continue to collaborate with SAE and industry to further refine any requirements or issues that newly arise and, as always with SAE documents that are updated after a regulation is adopted, will look to update regulatory references to the latest version at future regulatory reviews or revisions.

F. Service Information

1. Comment: 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. [OP-78]

   Agency Response: The intent of the standardized reprogramming requirements in the service information regulation is to reduce the costs to tool manufacturers and thus repair technicians and the rates they charge vehicle owners for service and repairs that involve reprogramming one or more on-board vehicle electronic control units (ECUs). To that end, it necessitates that manufacturers make their reprogramming compatible with a standardized SAE J2534 interface such that a personal computer or laptop with the vehicle manufacturer's reprogramming software installed can be mated to a vehicle, through a J2354 interface, and conduct the necessary reprogramming. With this approach, a repair technician can purchase a single J2534 interface and use it as the intermediate interface regardless of the make or model of the vehicle being reprogrammed. The commenter is raising concerns that the technology on some ZEVs has evolved so rapidly that the existing interface and structure may not even be needed or used in a typical reprogramming interface such as an 'over-the-air' remote software downloaded directly to the car from the manufacturer, which is then distributed, as necessary, to multiple ECUs on-board from a single ECU that received the download. In this example, providing for compatibility with a J2534 interface would involve a whole new mechanism that is not currently utilized. To address this issue, CARB made sure the requirement was clear that it only applied to ECUs that are reprogrammable in the field by an off-board tool and would not apply to ECUs or vehicles where the only possible way to reprogram it was through a remote over-the-air download or from software distributed by another on-board ECU. That said, even in an advanced technology deployment, every manufacturer has to make allowances to be able to field reprogram the one ECU that receives the download in cases where it fails, otherwise is replaced, or the access to receive a remote over-the-air update is

compromised. In such cases, the manufacturer could continue to be responsible for ensuring such a field reprogramming process was compatible with a J2534 interface. However, in recognizing that technology is continuing to evolve, staff added a flexibility for ZEVs to be able to use a process that, in lieu of being compatible with a J2534 interface, requires no intermediate interface at all and can be directly connected from the personal computer or laptop to the vehicle through a commonly available, non-proprietary connection such as a USB cable/port or a standard ethernet RJ45 cable/port. Given the ubiquitous availability of such cabling in today's world, service and repair technicians would not be expected to incur any significant costs or hardships to be able to connect from their laptop to the vehicle with such a connection thereby achieving the original intent of the J2534 interface. This added flexibility should help address the issues raised by the commenter.

2. Comment: The service information requirements in the ISOR have been updated to focus on "Propulsion-related parts" and HV Traction Batteries. As we set forth in the previous section on data standardization, MBAG does not believe generic scan tool requirements should be mandatory. The provision mandating auto manufacturers to make the enhanced diagnostic tool and related repair information to 3rd parties at a "Fair, reasonable, and nondiscriminatory price" is justifiable. To ensure customers have access to alternative repair options, MBAG supports this portion of the regulation, and we already make such enhanced tools and repair information available today through subscription options. [OP-120, 15-17]

   Agency Response: Relative to conventional gasoline vehicles, the standardized data requirements for ZEVs are very limited in scope and not intended to achieve the same purpose. For conventional vehicles, the majority of the standardized data was set up to facilitate inspection of vehicles to determine if emission repairs were needed and to facilitate access to a minimum amount of information necessary to help diagnose and repair such emission-related faults. For ZEVs, the majority of the data is to support testing of ZEVs as well as gain sufficient understanding of the in-use operation to be able to verify the certification data and test procedures are representative of in-use operation. For these data, it is not appropriate to require a subscription or paid access to service and repair information as the information is not intended to be used in such a capacity or by that industry sector. Unlike conventional vehicles, staff expects the service and repair community will definitively have to subscribe to a manufacturer's service information in order to effectively diagnose and repair such vehicles and made sure that the service information regulation mandates such access.

3. Comment: Currently, the reference to the basic definition of the J2534 version 05.00 API is missing. It should include SAE J2534-1_0500_202201 (January 2022), "Recommended Practice for Pass- Thru Vehicle Programming" for API version 05.00. This missing document provides the basic API definition for 05.00 version of the API. The other documents currently referenced in Section (A)2. are just extensions to that API and do not include the basic API details. This missing document is the version 05.00 equivalent to the basic 04.04 API definition already referenced in Section A as SAE J2534-1 "Recommended Practice for Pass-Thru Vehicle Programming" December 2004. The 04.04 and 05.00 APIs are slightly different and as such, the details for both versions must be included. [15-24]

Agency Response: CARB concurs this commenter that the "-1" document cited was not included in the regulatory language or in the references and that the associated SAE J2534 documents for the version 05.00 API that were included in the regulation further build off of the basic requirements included in the "-1" document. However, the included documents, which include both the J2534-2/BA_0500 (Base document) and J2534-2/RE_0500 (Resource document), clarify within them that they are intended to be implemented along with the requirements of the "-1" document the commenters cited. SAE has created a very structured but unique format in the numbering and sequencing of the J2534 document but industry has worked closely with CARB and SAE in that structure to ensure clear requirements for many different optional implementations. Within the proposed regulations, the allowed ethernet-related implementation options are clearly identified and incorporated by reference along with the "Base" and "Resource" documents that provide direction to users of how to implement the options. Given the interplay of the included documents that even go so far as to have the "-1" version incorporated as references into each of them, there does not appear to be a gap that would allow for an interpretation or implementation that is compliant with the incorporated documents while simultaneously being noncompliant with the "-1" document that was not included. Staff will, however, continue to work cooperatively with SAE and the manufacturers in further development of these and other standards and will update or revise incorporated standards as appropriate in future rulemakings.

4. Comment: Commenter supports the proposal's access to vehicle repair information data, tools and training for independent automotive repair facilities, and tool manufacturers [T1-21]

   Comment: The Association applauds the Air Resources Board staff for the amendments that are being proposed in order to ensure the repairability of zero emissions vehicles. Specifically, provisions that would require on-board diagnostic ports on zero emission vehicles; as well as the expansion of the service information availability provisions issued under section 1965 to include all "propulsion related information". Unrestricted access to on-diagnostic data combined with the availability of service information and advanced diagnostic tools will be critical to the ability of independent repair shops to being able to service the growing number of zero emission vehicles that we are expecting as a result of this regulatory effort. [OP-87]

   Agency Response: CARB appreciates the support and agrees providing for access by independent repair technicians is both necessary and appropriate to better ensure the likelihood of a successful transition to a predominantly ZEV fleet and ensure expected emission reductions are achieved.

5. Comment: The Association recommends that CARB consider amending the provision requiring information for "propulsion related systems" to include all data that is made available to manufacturer authorized repair facilities. The strong interrelationship between all systems on many late model software driven vehicles means that it will be difficult to delineate information needed for repairing propulsion systems from other systems on a ZEV. While we appreciate the requirement that manufacturers will be required to provide a list of all parts that are not propulsion related that they do not intend to provide service information for, we believe this provision will add a

significant compliance assurance burden on CARB, and manufacturers, requiring a judgement call regarding what is and is not required to be made available. Since the systems on alternative fueled vehicles are so integrated, it would be simpler and more straight forward to require all repair related data be made available to covered persons. [OP-87]

Agency Response: CARB considered this comment and weighed each and every requirement it included in the final proposal to ensure each was necessary. Much like for conventional vehicles where the service information requirements only apply to emission-related components, staff narrowed the scope only to that which was necessary to achieve CARB's needs. In that sense, CARB determined repairs to make the vehicle drivable (aka propulsion-related) were the appropriate subset needed to ensure older used vehicles could continue to be sufficiently repaired to remain usable and displace conventional cars.

It should be noted that, even though the CARB service information requirement is limited to emission-related components for conventional cars, virtually every manufacturer has chosen to make available all service information to facilitate customer satisfaction even on older cars. In recognition of this, staff did provide a path for manufacturers to similarly disclose all information on ZEVs rather than just the minimum propulsion-related information. And to further incentivize such behavior, this approach would provide relief from two additional reporting requirements regarding performance of the service information website and thorough disclosure of all parts determined by the manufacturer to be non-propulsion related. But, a manufacturer can still choose to meet the minimum requirements and only provide for access to propulsion-related information if it so chooses.

6. Comment: The Auto Care Association also fully supports provisions in the proposal that require scan tool access to the OBD data "without the use of any vehicle manufacturer-specific, user-specific, or tool-specific registration, authentication, authorization, login, password, certification, or other mechanism that can be used to restrict or limit user or tool access for any other reason." This requirement is relevant since many of the manufacturers have begun implementing proprietary firewalls that have created barriers to access the critical data needed to repair these advanced systems. [OP-87]

   Agency Response: CARB appreciates the support and agrees that, for the minimum dataset required to be standardized and made available, it would be inappropriate for manufacturers to impose restrictions or otherwise limit who can access such information. That said, this will not prevent manufacturers from imposing such requirements to access non-standardized proprietary data especially in situations where a valid security risk exists that could compromise the vehicle.

7. Comment: The Association further requests that CARB require a mandatory audit of manufacturer compliance with the requirements in two years from the effective date of the new requirements. This new proposal will institute new requirements on manufacturers, including companies that have had little to no experience with the current service information requirements. Further, many of these companies have strongly resisted efforts to permit their vehicle to be serviced by non-authorized repair

facilities. Therefore, proactive enforcement compliance efforts will ensure a smooth rollout of the new requirements. If an audit of all manufacturers is too much of a burden on CARB, we would be supportive of a staggered audit schedule. [OP-87]

Agency Response: The existing service information regulation already contains provisions for the Executive Officer, either on his/her own or upon receipt of a verified complaint from a covered person or entity, to engage in an audit process to verify manufacturer compliance with the requirements. These provisions have been retained in the final version updated to also cover access to service information for ZEVs. To date, manufacturers have overwhelmingly complied with the requirements and have typically been quick to respond to issues raised regarding missing information or access limitations. That said, staff agrees that there are some new entrants into the automotive sector that exclusively manufacture ZEVs and have not previously been subject to the emission-related service information requirement. As expected, staff will likely pay closer attention to some of these manufacturers as the requirements take effect to proactively verify manufacturers are taking steps to comply rather than wait for multiple years to pass. Many of these actions may fall outside the scope of the defined audit process that is narrowly focused on identifying and resolving suspected or known shortfalls in the manufacturer's compliance but can be more effective in early identification of thematic problems in how a manufacturer plans to comply that can be more readily addressed up front.

8. Comment: However, the proposal appears not to cover access to bi-directional features that could create issues in completing repairs for vehicles. While we understand the need for cyber security protections, we are concerned that based on the growing need to update vehicle software for ZEV's, the proprietary firewalls will mitigate the benefits to consumers and independents of the standardized OBD connector. We urge the CARB to expand the requirements for open access to data to include bi-direction capabilities or, alternatively, require that the firewalls be standardized across all makes and models. There are industry standards in place that would permit manufacturers to install firewalls, but would ensure that they are standardized in order to ease access for diagnostic tool providers and service facilities. A standardized method for registering and authorizing test equipment and technicians would provide both security and efficiency. [OP-87]

   Agency Response: Addressing this issue raised by the commenter is beyond the scope of this rulemaking. The required standardized data does not contain any 'bi-directional' features which arguably could necessitate security measures to prevent unauthorized access commanding the vehicle to do inappropriate or unsafe things. Staff understands the concern that access to information that will be necessary to service and repair ZEVs will likely contain proprietary commands that could make a vehicle more vulnerable to unauthorized access and that manufacturers may continue the current trend of adding layers of requirements to constrain that access. However, this issue is well beyond just ZEVs or just access for emission-related or propulsion-related information and the industry is already talking about potential approaches, desired outcomes, and unintended consequences. Staff will continue to track progress in this area and should it come to a point where the ability for independent repair technicians to cost-effectively and efficiently perform emission-related or

propulsion-related repairs appears to be appreciably threatened, staff will reconsider what further action could be taken to mitigate the situation to avoid an adverse impact on air quality or achievement of necessary GHG emission reductions.

9. Comment: We encourage CARB to avoid adding costs or other burdens and risks unnecessarily, through ZEV assurance measures. We remain seriously concerned about the mandate to require 3rd party access to vehicle systems. Our concern is based on both the philosophical basis for the mandate as well as its risks in practice… Access to a vehicle's electronic systems increases cybersecurity and safety risks for both the manufacturer and the consumer. Furthermore, there are countless examples of "defeat devices" for ICE vehicles for which a comparable product for BEVs could lead to performance enhancements at the expense of a vehicle's efficiency or safety systems. The continued insistence on including PHEVs as an ongoing part of the compliance program creates a more significant issue in this regard. For it is well known that manufacturers have increased performance at the expense of greater vehicle emissions in the recent past. As the State has endeavored to reign in bad actors in this space, it seems hardly productive to expand the list of potential bad actors from just the OEMs to include any and all independent actors. These challenges are paired with another concern over proprietary rights in advanced technologies. The significant development cost and effort for advanced BEV powertrain solutions constitute substantial investments in the creation of intellectual property, which might be jeopardized by a requirement to enable third-party access to vehicle systems. Such access implies a certain level of disclosure of hardware and software systems, and know-how. The considerable risks to cybersecurity, safety, intellectual property, and emissions goals should be carefully weighed in evaluating any access requirements. In conclusion, we do not believe it serves the public good to elevate economic concerns of an industry over the health and safety of the public. We would urge reconsideration of this policy on the whole and in its proposed scope. [OP-154]

   Agency Response: CARB considered this commenter's concerns over providing access to third parties, and is confident the Service Information rule does not require compliance with proprietary data. Section 1969(e)(2)(H) states manufacturers are not required to give any trade secret data, like specific algorithms and software code, unless they so choose. Much like conventional cars, access still requires a physical connection from an off-board tool to a connector located in the driver's footwell area of the vehicle interior and it requires the vehicle to be powered up (i.e., ready to drive) in order to access the data. Section 1969 requires manufacturers to give access to the same information that they would give to their own dealers or service centers sufficient to repair a vehicle to independent repair shops through a subscription website. Further, the data are largely limited to information regarding instantaneous and cumulative energy usage to verify that in-use performance is consistent with performance projected at the time of certification. Accordingly, the concerns about others also being able to read such data, when necessarily given permission to physically access it by the vehicle owner, seem unwarranted.

10. Comment: Commenter requests reconsideration to add the socket wrapper documents as optionally allowed under 13 CCR 1969 Motor Vehicle Service Information: J2534-2/13_0500_202201 (Ethernet, the API for Socket Wrappers);

J2534-2/15_0500_202201 (IPv6, the API for Socket Wrappers); J2534-2/16_0500_202201 (IPv4, the API for Socket Wrappers); J2534-2/17_0500_202201 (UDP, the API for Socket Wrappers); and J2534-2/18_0500_202201 (TCP CLIENT, the API for Socket Wrappers) [15-22]

Agency Response: While staff understands the desire of the manufacturer to include yet another set of flexibilities in how it implements the ethernet protocol, these added options provide an enormous additional burden to tool manufacturers to implement and validate. Necessarily, such resources translate to higher costs for repair technicians to purchase the tool and thus, higher rates charged to consumers for service and repair to cover the tooling costs. In talking with tool manufacturers, the added resources to provide this level of flexibility in implementation was substantial and would likely diminish the number of tool manufacturers willing to undertake such an update with uncertainty as to the expected usage by vehicle manufacturers. Accordingly, staff did not make any further changes such as those suggested by the commenter.

G. Battery Labeling

1. Comment: 1962.6 (b)(1)(B) Nominal System voltage and cell voltage We recommend simply specifying "Nominal system voltage and cell voltage" and deleting the rest of this paragraph. SAE J2288 does not specify these values. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

   Agency Response: Staff agrees with the commenter that SAE J2288 was an inappropriate reference to use and that 'nominal' system and cell voltage were insufficiently defined. Upon further investigation, staff identified a more appropriate reference and term and updated the regulatory language in the final adopted package to require the label to include the minimum voltage of the battery pack and cells as defined in a specification developed by Idaho National Laboratory and incorporated by reference.

2. Comment: 1962.6 (b)(1)(C) Individual Cell Count. This information is not needed quickly at the time of battery removal. Thus, instead of putting this on the battery label, we recommend allowing this information to be housed on the website required by subsection (c). [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

   Agency Response: CARB agrees with the commenter and adopted regulations which did not include a requirement for individual cell count to be on the physical battery label and added it instead to the information that must be housed on the website that the digital identifier on the label is linked to, as the commenter suggests.

3. Comment: 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. [OP-78]

Agency Response: The count of individual cells is no longer required on the physical label and instead, only on the website linked to the digital identifier on the label. By housing some of the more detailed information on the website rather than on the label, the requirement is intended to be more amenable to future revisions should CARB, manufacturers, recyclers, or other users identify that certain additional details are needed or some existing details are no longer needed. While such changes would need to made during a regulatory revision, the advantages of maintaining this information in a website/database that the label is linked to allow for such changes to readily be applied to prior, current, and future MY vehicles if so warranted.

4. Comment: Tesla requests that CARB amend proposed §1962.6(c)(2(J) to allow the data repository website to utilize web-based contact forms 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. [OP-78]

   Agency Response: As finalized, title 13, CCR, section 1962.6(c)(2)(I) does not provide an explicit option for a manufacturer to use a web-based contact form in lieu of providing an email and phone number to contact the manufacturer or its representative. While a web-based contact form may be more common practice these days for websites to provide a method for contacting a responsible person, they also provide less of an electronic trail for the person submitting the request and following up to see that it was handled. Given this is a regulatory requirement to have the website with the required information and that CARB needs to be able to audit manufacturers who are not meeting the requirements, an email address by which the sender generally automatically has a copy in his/her sent file could provide added traceability during audits to see if manufacturers are reasonably responding to submitted inquiries. That said, staff will continue to track industry progress on this requirement and could consider such a change at a future regulatory revision if so warranted.

5. Comment: We believe that CARB should directly reference SAE J1798 for specifying capacity, instead of SAEJ2288, which references the SAE J1798 standard. [OP-98]

   Agency Response: Staff's understanding is that the referenced SAE J2288 document is now stabilized by SAE, not expected to change in the future, and is more recent than SAE J1798 which is also stabilized and not likely to change in the future. Accordingly, staff used the reference to the newest document (J2288) as the most appropriate to adequately specify the procedures to be used by manufacturers to determine rated capacity. Should SAE further modify either document or a subsequent additional document that is more applicable, staff can consider updates at future regulatory revisions.

6. Comment: Commenter supports the proposed battery labeling requirement to assist reuse and recycling and enable a circular economy for battery material, but is concerned that the standardized battery state-of-health metric proposed does not require the ability to access information once the battery is removed from the vehicle. [OP-172]

Agency Response: Providing for a digital trail whereby the battery pack, or portions thereof, that have been removed from a vehicle would be able to be directly queried to communicate the last calculated battery SOH is a substantially higher technology burden than was considered in this rulemaking. Staff will continue to monitor industry and technology progress in this area to see if future architectures would be more amenable to such a requirement but as of today, staff's assessment is that it would require significant additional cost and hardware changes to battery packs and battery management systems. Under the newly adopted requirements, however, it would be possible for the battery to be physically labeled upon removal by the technician reading the battery SOH information from the vehicle and noting such information on the removed portion of the battery pack. This would not be that different from some conventional vehicle repairs where a transmission may be removed and sent to a separate facility for repair or rebuilding and information about malfunctions detected in that transmission would need to be read from the vehicle and passed along with that transmission rather than a method to automatically query the transmission in a stand-alone configuration. Lastly, it is not clear to staff yet how much value there would be in knowing the most recent on-vehicle calculation of battery SOH for a pack or portion thereof that has been removed. In such cases, it would seem probable that the battery being removed is not functioning properly and as such, there could be some doubt cast on the robustness of the calculated battery SOH that would likely lead to a battery rebuilder or re-purposer needing to independently assess that remaining capacity of the battery and test it for proper function.

7. Comment: Volkswagen requests clarification on the applicability of the traction battery labeling requirements on aftermarket or service battery parts that may be used to repair electric vehicle battery packs. Volkswagen recognizes that the underlying basis for labeling (facilitating repair, recycling and second use) could be equally applicable for cells or modules that are used to repair an OEM original equipment pack. If the repair parts are OEM sourced, the expectation could be that the repair parts would share the same online database and physical label contents as the original parts, except with new manufacturing dates. However, for parts that are sourced from aftermarket providers, those parts would require labels and online database information that is provided by the supplier and would not be able to leverage OEM information or point users to OEM listed database entries. [OP-96]

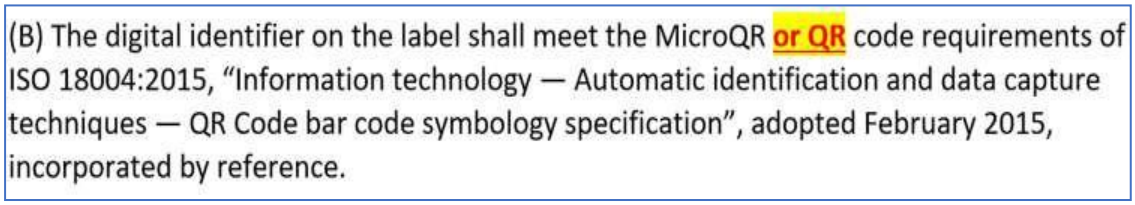
   Agency Response: Section 1962.6 applies to all 2026 and subsequent MY ZEVs certified for sale in California and requires such vehicles to have appropriate labels on their batteries and separately removable portions of the battery, as well as in the engine or cargo compartment. A manufacturer is subject to corrective action if it uses labels other than those approved at certification. As explained in Appendix F-8 to the ISOR, and as commenter acknowledges, these labeling requirements are important and necessary to facilitate servicing and repair, consumer confidence, and proper recycling and reuse. As such, these labels are intended to be present for the duration of the vehicle's life, and the information retained for even longer to inform secondary uses. Commenter is correct that OEM-sourced repair parts could share the same online database and physical label contents as the original parts (with new manufacturing dates). However, section 1962.6 does not explicitly require independent aftermarket parts providers to meet the labeling requirements. At this

time, CARB is unsure how prevalent independent aftermarket battery parts will be and, for the near-term, will track and consider the need for such an explicit requirement in the future.

8. Comment: (b)(1)(B) Minimum Voltage requirement INL/EXT-15-34184 Battery Test Manual. The test manual reference is applicable to battery electric vehicles (BEVs) with range equivalent to 200 miles based on Urban Dynameter Driving Schedule (UDDS) cycle. For vehicles with less UDDS miles like plug-in hybrid and hybrid vehicles, the minimum voltage should be specified by the manufacturer. [15-24]

   Agency Response: The commenter misunderstands the applicability of the referenced battery test manual developed by Idaho National Laboratory (INL). INL states in the opening sections of the manual that the Department of Energy (DOE) was interested in ways to benchmark individual components as technology advanced to better inform future funding decisions. And, to that end, DOE was initially thinking about what type of performance would be needed out of individual components to make a 200-mile BEV viable. But the procedures developed by INL are not restricted or designed to only work or only deliver meaningful results on components for 200-mile BEVs and in fact, needed to be able to accurately assess capability as technology progressed towards the improvements needed for a 200-mile BEV. The procedures were even designed with the intent that they could be used on a smaller scale than a full battery pack, such as individual cells or modules, and scaled up to represent likely capability in a full pack. Accordingly, no changes were made to the final adopted proposal.

9. Comment: (b)(3)(B), QR Code.The section requires label on the battery with a "microQR" to take the technician or dismantler to a website with additional, specified, information about the battery. Unfortunately, microQR codes have a maximum ability of 21 alphanumeric characters at the idea / highest error correction level (18 and 14 characters for lower error correction levels). This could create an unnecessary challenge to create a website link utilizing only 21 alphanumeric characters even after utilizing a paid URL shortening service. For example, the domain of autosinnovate.org/ is 18 alphanumeric characters, leaving only 3 characters for each unique battery digital identifier for the next 20 years. We do not believe it was CARB's intent to limit the label to only microQR code and recommend the following non-substantial change.



[The image displays the text of proposed section 1962.6(b)(3)(B), plus the commenter's suggested addition of the phrase, "or QR," which is in red print and highlighted. The resulting provision suggested by the commenter is, "The digital identifier on the label shall meet the MicroQR or QR code requirements of ISO 18004:2015, 'Information technology — Automatic identification and data capture techniques — QR Code bar code symbology specification', adopted February 2015, incorporated by reference."]

[15-24]

Agency Response: Staff agrees with the commenter that the intent was not to restrict manufacturers specifically to the microQR variant of a QR code. The incorporated ISO reference in the regulation covers both standard QR codes and the microQR variant. Accordingly, staff made a non-substantive change to the final adopted proposal to more accurately state that the label shall meet the QR code requirements of the incorporated ISO reference. This change clarifies that manufacturers can utilize either version of the QR code for the battery label as both are equivalently standardized in the ISO reference and both provide for equivalent in-use capability for a user to read the QR code and access the linked website.

H. ZEV and PHEV Charging Requirements

1. Comment: Rivian supports efforts to increase at-home charging access. We already provide a user-selectable cord capable of both L1 and L2 charging with each vehicle and believe the convenience cord requirement is both achievable and valuable for increasing EV adoption. Nonetheless, Rivian notes that the current proposal only considers half of the equation and does not remove the need for an electrician to confirm the electric capability of an outlet and corresponding electrical infrastructure to safely charge an EV. Though we welcome the convenience cord requirement as one piece of the larger charging ready strategy, we encourage further consideration into the technical requirements needed to prepare homes for EV charging. [OP-127, B1-10]

   Comment: Commenter would like to thank the board members and staff members with whom they discussed Subsection 1962.3 related to a charging cord to be provided as standard equipment for battery electric vehicles beginning in model year 2026. Discussions with board members and staff have provide important perspective and clarifications that supplement ChargePoint's understanding of Subsection 1962.3. Commenter looks forward to working with board members, staff, and stakeholders in the coming years to ensure that the goals of convenient and accessible charging are achieved in accordance with the critical product and installations standards contained in the current and upcoming versions of UL specifications and the National Electric Code. [B2-7]

   Agency Response: CARB appreciates the support for the convenience cord requirement in the Advanced Clean Cars II regulation. Technical requirements needed to prepare homes for EV charging is outside of the scope of the EV charging requirements in the Advanced Clean Cars II regulation but staff agrees that it is equally important and CARB continues to be involved in several actions with our partner State agencies to make homes, multi-unit dwellings, and workplaces ready for more capable charging.

2. Comment: Commenter does not support mandating a Level 1 and Level 2 convenience charger with every vehicle sold. [T1-68, OP-134]

   Comment: CARB could remove the convenience cord requirement and revisit the issue prior to model year 2026. [15-8]

Agency Response: As explained in the ISOR, requiring a Level 1 and Level 2 capable convenience charger with every vehicle sold is a necessary element to increase the likelihood of a successful transition to a predominantly ZEV fleet as needed to meet California's clean air and GHG emission reduction targets. At this early stage of ZEV deployment, especially in the used car market, most purchasers do not already have charging equipment installed at their residence and the provided convenience cord is their first experience with charging. By including a cord that also has Level 2 capability, the vast majority of purchasers that already have access to a 220 Volt circuit for charging will be able to start using Level 2 charging for little to no further cost rather than be faced with purchase of a standalone Level 2 charger typically ranging from several hundred to a thousand dollars or more. As noted in the ISOR, Level 2 charger users have a much more satisfactory experience with the plug-in vehicle and are more likely to continue to plug-in frequently and purchase another plug-in vehicle. Given the critical need to transition the entire fleet as quickly as possible, we can ill afford an increase in unsatisfactory at-home charging experiences that may stifle continued adoption of ZEVs. Further, for new or used ZEV purchasers who may not have consistent access to a dedicated home charging connection, the flexibility of a single cord that can be adapted for use in either Level 1 or Level 2 situations increases the likelihood of the user being able to adequately secure a charge despite the dynamic nature of where the vehicle may be parked or what type of circuit it may get the opportunity to access.

3. Comment: In addition to the staggering compliance costs, this requirement may discourage some customers from installing level 2 (L2) chargers. Manufacturers encourage installed L2 chargers because they typically offer faster and safer (compared to a charging cord laying on the ground) and may be set up to allow the customer to take advantage of time of day or demand response charging with the local utility, where the charging cord will not. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

   Agency Response: Staff agrees that this requirement may eliminate the need for some customers to separately purchase a dedicated Level 2 charger for their residence. The intent of this requirement is to avoid such additional out of pocket costs by the consumer where it is not necessary while still allowing them access to the improved Level 2 charging experience. And when considered in context of additional costs to the Level 1 only convenience cord provided by some manufacturers, the incremental manufacturing costs and thus costs passed onto consumers is far less than a hundred dollars, which is well below even the cheapest available dedicated home charger. This incremental cost is far from appropriately characterized as 'staggering' and represents a highly cost-effective approach for the average user to gain access to a Level 2 charger. Further, for those new or used vehicle purchasers that don't necessarily have a consistent place to charge, the flexibility of the cord better ensures that whatever circuit they end up with access to, they will be able to make use of it. Lastly, regarding access to charging features like time of day or demand response, many dedicated home chargers do not provide such capability. On the other hand, most vehicles already do provide capability to be programmed by the user to preferentially charge in off-peak hours and many additionally have a cell phone app that provides the user

with additional flexibility in starting or stopping a charging event in cases of peak demand or other energy management actions.

4. Comment: CARB received comments recommending that convenience cords just be made available at the time of sale, or consumers could opt out to reduce vehicles costs. [15-17, OP-98, 15-26, 15-8]

   Comment: If CARB decides to maintain this requirement, we recommend updating the requirement to allow a convenience cord to be "made available as an accessory" with each vehicle. This would allow the manufacturer to make it available at the dealer, include a voucher or something similar for a free charging cord. This would allow the vehicle to be tested without the cord, and ensure the customer wants the convenience cord. Tesla found very low usage of the portable charger and stopped including it with new Tesla vehicles. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

   Comment: CARB only require that auto companies offer the convenience cord at the time of sale. Such a requirement is unnecessary as it is not realistic that most customers will fail to keep a charging cord for their vehicle because it will instead be used for home charging. Furthermore, not all customers will want the cord as they may already have one from a previous vehicle. [OP-120, 15-17]

   Comment: While CARB has recognized Tesla's industry leading mobile connector cord, 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. [OP-78]

   Agency Response: As noted on page 50 of the ISOR, increasing the ease of home charging is crucial to facilitate ZEV uptake and retention. Charging is a persistent frustration and barrier to ZEV adoption in consumer studies. By requiring all vehicles to have an included charging cord that is Level 1 and Level 2 capable, at various amperages, and with a minimum 20-foot length, the cord can meet the charging needs of a much larger portion of vehicle owners. Further, as a basic cord is already included, the incremental cost to upsize that cord to be more capable is less than the costs a consumer would face to purchase separate Level 2 equipment to meet their needs. Surveys show drivers with access to Level 2 charging are more satisfied with their ZEVs and PHEVs and are more likely to purchase an ZEV for their next vehicle. As the market expands to lower price point vehicles to appeal to more diverse vehicle owners including used vehicle purchasers, it is important to reduce any barriers, perceived or real, that would discourage selection of a BEV or PHEV. Lastly, as directed by the Board in the resolution, staff will continue to monitor the progress of technology, consumers, and industry to report back to the Board and, where

warranted, bring regulatory revisions for consideration that address issues or otherwise increase the likelihood of a successful transition to a predominantly ZEV fleet. If staff finds that this requirement is no longer necessary at some future point or that further changes or provisions are warranted such as allowing consumers to opt out or to choose an alternative feature without risk of unintended consequences like added dealer mark-up, it will bring those changes for consideration by the Board.

5. Comment: 1962.3. (c)(3)(B)1. 24A requirement This paragraph should provide a 24A or sufficient power to charge a vehicle in 4 hours or less. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

   Agency Response: CARB concurred with this commenter and added "or sufficient power to enable charging from a state of discharge to a full charge in less than 4 hours, whichever is lower" to section 1962.3(c)(3)(B)2. through its First 15-Day Notice.

6. Comment: (c)(4) DCFC requirement PHEVs should not be required to include a DCFC, since this would only add cost and is not likely to be needed. We recommend revising this paragraph accordingly. [OP-155, incorporated by reference into comments B1-20, OP-124, T1-8, T1-9, OP-57, OP-98, OP-150, OP-95, T2-34]

   Agency Response: CARB concurred with this commenter and clarified that section 1962.3(c)(4) applied to all BEVs through the changes proposed in the First 15-Day Notice. It also clarified that if PHEVs are equipped with a DC inlet, then those vehicles would be also be subject to the same DC fast charging standardization requirements.

7. Comment: Commenter recommends changes to the proposal for automakers to provide a charging cord capable of Level 1 and Level 2 charging by removing the Level 2 requirement in 1962.3(b) and 1962.3(c). [T1-60, OP-159, 15-26]

   Agency Response: Requiring the supplied cord to be a Level 1 and Level 2 convenience charger is one of several measures in the final adopted proposal intended to increase the likelihood of a successful transition to a predominantly ZEV fleet as necessary to meet California's clean air and GHG emission reduction targets. The requirement is important to ensure a vehicle owner can more readily adapt charging to make use of the supplied cord with existing residential circuits and no additional costs to either modify the home wiring or buy a different charger. See response to Comments H-2 for CARB's reasoning for including a convenience cord requirement in the manner in which it was adopted.

8. Comment: Commenter suggests modifying the proposal by removing the user selectable variable amperage requirements in 1962.3(c). [T1-60, OP-159, 15-26]

   Agency Response: Including the selectable variable amperage requirements in 1962.3(c) is critical to ensure that a vehicle owner can more readily adapt the vehicle charging to be compatible with existing residential circuits and no additional costs to either modify the home wiring or buy a different charger. In Level 1 charging, the ability to downgrade the charging amperage can address issues where charging is utilizing a non-dedicated circuit and other circuit devices (e.g., garage freezer, second plug-in vehicle) are also drawing current which otherwise would exceed the circuit

capability. In Level 2 charging, many vehicle manufacturers have implemented charging capability that exceeds the lowest amperage 220 Volt circuits that are found in some garages. Without the ability to downgrade the amperage, the vehicle owner would have no ability to make a 40 amp capable charger compatible with an existing 30 amp or 20 amp 220 Volt circuit and would be faced with either purchasing a dedicated lower amperage home charger or having a more capable electrical circuit installed, both of which could be at significant cost to the vehicle owner. This feature of downgrading, which is already available on several manufacturers' vehicles and/or convenience cords, increases the chance of providing access to convenient and reliable charging without the consumer needing to spend more money out of pocket.

9. Comment: Finally, the 15-day proposal includes a revision to §1962.3 (c)(3)(B)2 that requires the charging cord to have "sufficient power to enable charging from a state of discharge to a full charge in less than 4 hours…" The plain language of that proposed section is clear that a charger cord's capability should be the lesser of 24 amps or a full charge in less than four hours. However, the summary description of the proposed change does not reference that the capabilities should be the lesser of 24 amps or 4 hours for a full charge. Instead the description states "Staff is proposing to add language to make clear that the required charging cord must provide sufficient power to enable charging from a state of discharge to a full charge in less than 4 hours." Clarification of the intent of the section and capabilities of the charging cord are needed. Tesla recommends clarifying that the intent of the change is that the cord should have an amperage rating at the lesser of 24 amps or the amps required to charge the car from a state of discharge to a full charge in less than 4 hours on Level 2. Otherwise, the description document could be interpreted to require a 100-kWh vehicle to have a charging cord (and onboard power electronics) that is capable of charging at 25 KW of alternating current in order to achieve a full state of charge in 4 hours. [15-8]

   Agency Response: Staff agrees with the commenter and revised the language accordingly. The Final Regulation Order for amendments to Section 1962.3, Title 13, California Code of Regulations released on August 22, 2022 for the August 25, 2022 Board hearing proposed the following amendments to §1962.3 (c)(3)(B)2: "AC Level 2 minimum amperage capability shall be 24 amps or sufficient power to enable charging from a state of discharge to a full charge in less than 4 hours, whichever is lower".

10. Comment: Commenter encourages CARB to include regulations that mandate automakers allow electric vehicle drivers to set the charge level of their Level 1 charging, with a maximum of 16 amps when drivers are using a dedicated 20-amp circuit for their Level 1 charger. [15-13]

    Agency Response: For this rulemaking, staff focused on ensuring that manufacturers provided for an acceptable level of minimum charging performance. Historically, CARB has not seen it necessary to mandate the maximum level of charging performance as manufacturers have used such capability to compete with other manufacturers. For this particular comment, staff is aware that some Level 1 110 Volt circuits are dedicated 20 Amp circuits and as such, would be able to support a 16 Amp Level 1 charger. However, staff's experience is that such circuits are not that common and less so in cases where no other electrical consumers are being used on the circuit.

Further, with the proposed regulatory changes that increase the minimum range of PHEVs and BEVs, the slightly faster Level 1 charging with such a circuit provides minimal added convenience to the charging especially when compared to the significant improvements in charging speed from moving to Level 2 charging. Lastly, it should be noted that manufacturers are not prohibited from designing the convenience cord or vehicle to be able to charge at 16 Amps on Level 1 and notably, vehicles like the Chevrolet Volt were designed to specifically allow it. However, the final adopted amendments do not require that manufacturers support 16 Amps on Level 1 charging.

11. Comment: Based on current battery electric vehicle (BEV) owner behavior and increasing availability of public charging for long trips, it is likely that charging cords supplied pursuant §1962.3(c)(3) will be kept at home for home charging use and will not be kept inside the vehicle, except for rare occasions. In light of this anticipated usage of §1962.3(c)(3) charging cords, Auto Innovators' members intend to exclude charging cords from applicable Equivalent Test Weight (ETW) calculations. We seek CARB confirmation that the weight of the charging cord can be excluded from ETW. [15-24]

    Agency Response: The current regulation and incorporated test procedures already provide for manufacturers and CARB to determine the vehicle curb weight to be used when establishing the test weight for certification. These provisions are predominantly in the Code of Federal Regulations (CFR) and incorporated into CARB's test procedures and have been used historically to sort out what optional equipment or accessories offered by the manufacturer are to be included when determining the applicable weights. CARB intends to continue past practice of using this language, incorporated identically to the federal language, to evaluate each manufacturer's requests and determination of test weight on its individual merits. With regards to the charge cord in particular, manufacturers are able to request exclusion of the cord in the same manner they would for other optional or accessory components consistent with the regulatory provision. No change was made in response to this comment.

12. Comment: (e)(1)(B) Partial Credit PHEVs (2026-2028) Charging Requirements
    This section requires 2026-2028 Partial Credit PHEVs to meet "the criteria identified in Section of (e)(1)(A)1 through (e)(1)(A)6." Since the charging requirements for PHEVs receiving full-PHEV credits are contained in (e)(1)(A)7, we interpret this to mean the charging requirements in 1962.3 are not required for 2026-2028MY Partial Credit PHEVs meeting the requirements of (e)(1)(B). [15-24]

    Agency Response: The staff agrees that the interpretation stated in the comment is correct and the cited section of title 13, CCR section 1962.4 was intended to exempt these phase-out, partial credit PHEVs from the newly adopted charging provisions applicable to future ZEVs and PHEVs. This exemption was intended to be consistent with the rationale for allowing partial credit PHEVs in that they are vehicles likely designed prior to the adoption of the enhanced charging requirements and they need a few extra MYs to complete their normal production run before being able to be redesigned and updated in the most cost effective manner such as during a normal scheduled product redesign or refresh. And, as adopted, this language achieves the intended purpose of excluding these PHEVs from being required to meet these new

charging provisions in section 1962.3 such as a more capable convenience cord and on-board charger or standardized connector for fast charging. However, this language as adopted also inadvertently exempts these PHEVs from all requirements in section 1962.3 including those that are already applicable to PHEVs and would continue to remain applicable through the 2025 MY such as a standardized connector for level 2 charging. While that was unintended, it is a proper interpretation of the newly adopted language. However, as these PHEVs are expected to be legacy vehicles, designed prior to 2026 MY, they will have to be designed to meet the current charging requirements through 2025 MY and as such, it is unlikely they would subsequently be redesigned for 2026 through 2028 MYs to make them noncompliant even though the ACC II regulations would allow for it. No change was made in response to this comment.

13. Comment: Commenter supports requirement for DC fast chargers on all new electric vehicles. [T1-44, OP-173, B1-12, B2-9]

    Agency Response: CARB appreciates support for the efforts and goals of the EV charging requirements in the Advanced Clean Cars II regulation. CARB adopted the final Advanced Clean Cars II regulations at its August 25, 2022, hearing.

14. Comment: Commenters oppose staff's proposal to require the CCS1 charging standard, stating consumer confusion, lack of CCS standard compatibility testing between chargers and vehicles, and bi-directional charging as reasons to also support CHAdeMO. [T1-44, OP-173, B1-12, B2-9, T2-45]

    Comment: Commenter strongly request the Board to direct Staff to remove Section 1962.3(c)(4) "Direct Current Charger Inlet and 1962.3(c)(5) Alternative Option for DC Charger. Allow Automakers to select the best DCFC technology for their customers without regulation. [B2-9]

    Agency Response: Staff's proposal for standardizing the SAE J1772 standard for 2026 and subsequent MY BEVs and PHEVs (if they are DCFC charge capable) stems from the fact that a majority of manufacturers are coalescing around the SAE J1772 standard in current vehicle production. For example, in 2020, 13 available BEV models were outfitted with a CCS1 inlet while four BEV models had the Tesla inlet and only two BEV models were outfitted with CHAdeMO. In 2022, 51 vehicle models are expected to have the SAE inlet, six are expected to have the Tesla inlet and two are expected to have the CHAdeMO inlet. Choosing the SAE J1772 standard for new vehicles would impact the fewest regulated manufacturers, further standardize charging across the market domestically and internationally, minimize costs, and increase access to charging equipment – all of which leads to greater consumer acceptance and therefore deployment of ZEVs in place of conventional vehicles.

15. Comment: CARB should adopt a Performance Standards (require installation of a DCFC connector on all BEVs) in place of Prescriptive Standards (requiring only the CCS-1 standard) in compliance with Government Code section 11346.2(b)(4)(A). (ISOR p.180). [OP-173]

    Agency Response: As discussed in the ISOR on page 47 and at length beginning at page 53, the requirement for future vehicles to be compatible with the CCS-1

standard for DC fast charging is a standardization requirement necessary to increase the likelihood of a successful transition to a predominantly ZEV fleet. Through the 2025 MY, the ZEV requirements have neither required all BEVs to have DC fast charging capability nor specified compatibility with any specific inlet or connector. However, as the market has developed and BEVs have become full replacement vehicles, the need for DC fast charging infrastructure is increasing to support such vehicles during longer trips or to supplement where convenient workplace or home charging is not available. To increase the ability of a successful rapid deployment of such infrastructure, a single standardized connector is beneficial to car manufacturers, infrastructure providers, and, most importantly, consumers as there will be increased confidence in being able to charge at whatever charging station is convenient and not have an incompatibility issue. Much like gasoline and diesel vehicles and infrastructure today where both the dispensing nozzles and the filler neck on vehicles must meet defined dimensional design standards, it is a standardization issue to ensure compatibility across all vehicle and infrastructure brands and to increase consumer acceptance and confidence that they can consistently refuel regardless of the brand of their car or the refueling station they stop at.

The commenter mischaracterizes the effect of Government Code section 11346.2(b)(4)(A), which does not prohibit agency adoption of prescriptive standards. Rather, the provision requires agencies to consider whether a performance standard would comprise a reasonable alternative to a proposed prescriptive standard. Agencies must also explain their reasons for rejecting reasonable alternatives to the regulations they adopt. Here, the staff analysis did consider the alternatives of standardizing to an alternate connector than the CCS-1 and not standardizing at all. Both alternatives were rejected, as the first approach would incur much greater costs given the number of vehicles and infrastructure that have already been deployed using the CCS-1 connector, and the second approach would fail to directionally address the issue today of confusion in the marketplace as to where particular BEVs can be charged and which connectors should be used on infrastructure that is yet to be deployed. Given the high voltage and amperages involved in DC fast charging, vehicles and infrastructure need to be designed to some form of a prescriptive standard defining the physical and electrical properties of the connector so that they are compatible and safe for consumers to use. There is no performance standard that can or would be appropriate to use. Up to this point, staff has allowed the vehicle manufacturers, infrastructure providers, and market to establish and deploy such standards but it has now reached a point where further direction in the form of a single standard is needed to support a substantially faster transition to a predominantly ZEV fleet.

To the extent the CCS-1 standard specifies the configuration of the equipment, it is justified for the reasons above, as CARB recognized in adopting the ACC II regulations in Resolution 22-12, at page 17. The ACC II regulations do not preclude a manufacturer from equipping their vehicles with other kinds of DCFC connectors, as Tesla, for example, has done.

16. Comment: These are the deficiencies of CCS-1 Fast Charging Standard: not global standard, North America only, no support for legacy vehicles – no adaptors, no

support bi-directional (VGI) power flow, PLC communication signals subject to denial-of-service attack, no independent certification and compliance verification, no development path for unification of existing or future fast charging standards. [OP-173]

Agency Response: Staff acknowledges that no single approach or design simultaneously is the perfect solution for every element. For this specific element of standardizing the DC fast charging inlet, industry had largely already chosen a common path forward with all but six of the current plug-in vehicles already utilizing the CCS-1 inlet connector on the vehicle and at least two of the other six built with the capability to use an adapter to CCS-1 based on customer demand and requirements in other global markets. In regards to specific shortfalls identified by the commenter, a global standard is not a likely outcome given the different electrical grid architectures. The highest chance for success in any market is going to be one that works the easiest within their electrical grid architecture despite the impact on vehicle manufacturers to support different configurations. Yes, the CCS-1 connector is designed for the North American electrical grid and will not likely find a presence in Europe just like the CCS-2 variant common in Europe will not likely find a presence here in North America. The regulation provides flexibility for manufacturers to comply by directly using a CCS-1 connector on the vehicle (solely or in addition to any other manufacturer-desired DC fast charging connectors) or by providing for an adapter to allow a CCS-1 compatible charger to be mated to the vehicle. Tesla, one of the manufacturers who is using a proprietary DC fast charger connection in North America, already makes such an adapter for a few of their models despite the commenter's assertion that there are no adapters possible or available. Regarding bi-directional power flow, one alternative DC fast charge connector known as CHAdeMO asserts an advantage of already being able to do bi-directional DC energy. However, this necessitates that the vehicle can plug into a DC fast charger and then remain plugged in for long dwell times to be able to provide energy as needed. In the U.S., such DC infrastructure is virtually exclusively limited to fast charger stations where drivers are attempting to minimize their dwell time and secure as much charge in as short of time as possible in the midst of their travel rather than stay parked to facilitate outgoing energy. Wherever there are longer dwell times, like at a residence or workplace, such chargers are more commonly Level 1 or Level 2 AC chargers which is also why there is more focus in the U.S. on outputting AC energy from vehicles rather than DC energy rendering any bidirectional capability advantages on DC rather meaningless. Further, there are no technical barriers to being able to similarly output DC energy through the CCS-1 connector. To the extent there is a need for such capability, it is likely the SAE committee would work to support such capability within the existing connector. Outputting AC energy also is more common currently in cases of using a BEV to directly power tools at a jobsite or portions of a home during power outages.

For the comment regarding independent certification and verification, the commenter is referring to a process whereby a specific CHAdeMO entity mandatorily charges vehicle manufacturers and infrastructure suppliers to pay CHAdeMO for testing and verification before being allowed to use the CHAdeMO name. While this approach undoubtedly has reduced incompatibilities in the field, it would be inappropriate for a governmental agency to write a regulation effectively giving CHAdeMO an exclusive

ability to charge all manufacturers whatever it deemed appropriate. Further, such independent verification does not require such an exclusive approach and, as has been done for other standardization requirements that CARB has adopted such as standardized communications for on-board diagnostic systems, staff have begun working with SAE to develop a standard for such verification testing that could be carried out to ensure that all vehicles built will be within the tolerances and specifications of the CCS-1 standard. Implementation of such a testing requirement could take several forms in a future requirement but would not be subject to one entity having an exclusive ability to do such testing. Lastly, regarding unification of existing or future fast charging standards, it is unclear what the commenter is citing as the shortfall. No adopted standard can be completely future-proof in predicting and planning for every advancement in technology that will happen in the future. That said, the SAE committee with responsibility for the CCS-1 specification is constantly assessing developments in technology and modifications that can be implemented to continue to expand the capability for the future in terms of supporting faster charging rates or an improved consumer experience in robust and reliable charging events.

17. Comment: 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-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. [OP-78]

    Agency Response: The adopted ACC II requirements for CCS standardization aims to ensure drivers of these vehicles can also access other types of stations (which also increases convenience and therefore promotes ZEV adoption). Infrastructure development with other State agencies is outside of the scope of the Advanced Clean Cars II regulation.

18. Comment: Commenter states that 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. [OP-78]

Agency Response: Manufacturers with vehicles that do not meet the proposed regulation would have multiple paths to comply and sufficient lead time to comply. Manufacturers could readily design and equip future vehicles with a SAE J1772 compatible inlet since vehicles already have the wire, cooling, necessary processing chips, and inlets for DC charging. This primarily leaves the difference in the communication protocol, and shape and configuration of the connector. Given the lead time in adopting this new proposal, manufacturers have been provided sufficient time to implement such a change during a normally scheduled redesign or refresh interval for the vehicle at little or no additional cost using currently available technology. As an example, Tesla already went through a similar process to switch Model 3 vehicles produced in the U.S. but sold in Europe to be equipped with an SAE J1772- compatible inlet as required by European regulation. Further, due to the fewer number of wires and pins required for SAE J1772 versus CHAdeMO, the ability to integrate an SAE J1772 inlet into the same charge door/port on the vehicle as the Level 1 and Level 2 connector, and the higher volume of SAE J1772 connectors expected to be used (leading to increased competition among more suppliers), manufacturers may realize a cost savings by switching to the proposed CCS standard. Alternatively, manufacturers could choose to add the required connector in addition to their alternative connector or provide an adapter to connect between their connector and the required one. This latter method is how Tesla chooses to comply with the current requirements for SAE J1772 compatibility for Level 1 and Level 2 charging.

19. Comment: Given Tesla's significant percentage of Californian EV sales, the Tesla Supercharger network is by far the most ubiquitous DCFC network and arguably the most reliable, and has the highest customer satisfaction in the industry. 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. [OP-78]

    Agency Response: Staff acknowledges that Telsa has committed substantial resources to deploy its own DC fast charging network and that early Tesla owners are generally satisfied with its performance. However, California needs to transition the entire vehicle fleet to predominantly ZEVs to meet its clean air and GHG reduction targets, and manufacturer-specific deployment of charging stations with unique vehicle connectors would be a cost-ineffective way to achieve that ultimate goal. The newly adopted regulations ensure that all future ZEVs with DC fast charging will be compatible with a single connector thereby facilitating consumer understanding and acceptance of being able to charge, regardless of their brand of vehicle or charging station they stop at. Access to more charging stations is advantageous for all consumers, including Tesla's current and future vehicle owners who may have different charging needs than Telsa's existing infrastructure can conveniently provide. Even with the limited number of Teslas in-use already, the manufacturer has acknowledged a demand by consumers to be able to charge at non-Tesla DC fast chargers by offering an adapter for sale on its website with a description of the adapter that says: "Expand your fast charging options with the Tesla CCS Combo 1 Adapter. The

adapter offers charging speeds up to 250kW and can be used at third-party charging networks."

The commenter's claim that this places a significant cost burden on Tesla and not other manufacturers is incorrect. Under the adopted proposal, Tesla has multiple options to comply and could choose a path for vehicle compliance that is the same as many other manufacturers. Specifically, Tesla could solely equip their vehicles with a compliant connector as it has already done on some of its models in other global markets. Alternatively, Tesla could continue to equip its vehicles with its proprietary connector, in addition to or in lieu of, the required connector or provide an adapter. To the extent either of these solutions present increased costs, that would be part of the consideration by Telsa to elect to use either of these flexibilities. And these same choices are faced by other manufacturers.

The commenter's allegation that the section is discriminatory, penalizes innovation, raises electric vehicle prices, and has no substantive record justification lacks specificity and therefore, CARB is not able to respond further. CARB has provided a sufficient record justifying all sections of the ACC II regulation.

20. Comment: 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. Most Tesla drivers use DCFC infrequently, if at all, and fast charging is typically used 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. [OP-78]

    Agency Response: Without open access to DCFC stations, BEVs will not be able to charge in the shorter times that are more comparable to conventional vehicles, and thus may not be suitable for use by drivers in a way that displaces conventional engines and their associated emissions.

21. Comment: 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. [OP-78]

    Agency Response: Staff's proposal aims to ensure drivers of these vehicles can also access other types of stations (which also increases convenience and therefore promotes ZEV adoption). While Tesla's experience to date, consisting of less than a decade of experience with four higher price point vehicles and predominantly new vehicle purchasers, may indeed show their typical owner is largely satisfied exclusively using its own proprietary network, staff is not convinced that the situation will remain the same when the vehicles are 20 years old, in the hands of 3rd or 4th owners, substantially depreciated in value, and competing with nearly 10 times more ZEVs on the road competing for space at the charging stations. With the need to transition to a predominantly ZEV fleet as rapidly as possible, taking action today to ensure all cars

will be compatible with a single DC fast charging connector improves the chances that there will be sufficient compatible charging infrastructure to support the charging needs.

22. Comment: Allowing manufacturers to make adapters and charging cords available at retail are reasonable alternatives. 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. [OP-78]

    Agency Response: Manufacturers with vehicles that do not meet the proposed regulation would have multiple paths to comply and sufficient lead time to comply. Manufacturers could readily design and equip future vehicles with a SAE J1772 compatible inlet since vehicles already have the wire, cooling, necessary processing chips, and inlets for DC charging. This primarily leaves the difference in the communication protocol, and shape and configuration of the connector. Given the lead time in adopting this new proposal, manufacturers have been provided sufficient time to implement such a change during a normally scheduled redesign or refresh interval for the vehicle at little or no additional cost using currently available technology. As an example, Tesla already went through a similar process to switch Model 3 vehicles produced in the U.S. but sold in Europe to be equipped with an SAE J1772- compatible inlet as required by European regulation. Further, due to the fewer number of wires and pins required for SAE J1772 versus CHAdeMO, the ability to integrate an SAE J1772 inlet into the same charge door/port on the vehicle as the Level 1 and Level 2 connector, and the higher volume of SAE J1772 connectors expected to be used (leading to increased competition among more suppliers), manufacturers may realize a cost savings by switching to the proposed CCS standard. Alternatively, manufacturers could choose to add the required connector in addition to their alternative connector or provide an adapter to connect between their connector and the required one. This latter method is how Tesla chooses to comply with the current requirements for SAE J1772 compatibility for Level 1 and Level 2 charging.

23. Comment: 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, 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. [OP-78]

Agency Response: Staff's proposal aims to ensure drivers of these vehicles can also access other types of stations (which also increases convenience and therefore promotes ZEV adoption). Manufacturers with vehicles that do not meet the proposed regulation would have multiple paths to comply and sufficient lead time to comply. Manufacturers could readily design and equip future vehicles with a SAE J1772 compatible inlet since vehicles already have the wire, cooling, necessary processing chips, and inlets for DC charging. This primarily leaves the difference in the communication protocol, and shape and configuration of the connector. Given the lead time in adopting this new proposal, manufacturers have been provided sufficient time to implement such a change during a normally scheduled redesign or refresh interval for the vehicle at little or no additional cost using currently available technology. As an example, Tesla already went through a similar process to switch Model 3 vehicles produced in the U.S. but sold in Europe to be equipped with an SAE J1772- compatible inlet as required by European regulation. Further, due to the fewer number of wires and pins required for SAE J1772 versus CHAdeMO, the ability to integrate an SAE J1772 inlet into the same charge door/port on the vehicle as the Level 1 and Level 2 connector, and the higher volume of SAE J1772 connectors expected to be used (leading to increased competition among more suppliers), manufacturers may realize a cost savings by switching to the proposed CCS standard. Alternatively, manufacturers could choose to add the required connector in addition to their alternative connector or provide an adapter to connect between their connector and the required one. This latter method is how Tesla chooses to comply with the current requirements for SAE J1772 compatibility for Level 1 and Level 2 charging.

24. Comment: Commenter requests the regulation use the most recent version of SAE J1772. [15-17]

    Comment: Commenter states that SAE Hybrid Committee is currently in the process of finalizing and publishing the SAE J1772 2022 edition. Therefore, MBAG recommends that CARB revise the text in § 1962.3(c)(1) and § 1962.3(c)(4) of the regulation to allow for the use of this version of the standard when it is published and any future revisions of the standard. In the first sentence of subsection 1962.3(c)(1), commenter suggests replacing "SAE J1772 REV JAN 2017" with "SAE J1772 REV JAN 2010." Commenter suggests adding as the second sentence, "For the 2023 and

subsequent model years, all vehicles identified in subsection (a) must be equipped with a conductive charger inlet and charging system which meets all the specifications applicable to AC Level 1 and Level 2 charging contained in Surface Vehicle Standard SAE J1772 REV OCT 2017, or the most recent published version of the standard, SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charger Coupler, which is incorporated herein by reference." In subsection 1962.3(c)(4), commenter suggests following the words "SAE J1772 REV OCT 2017," with the phrase, "or the most recent published version of the standard." Commenter notes, however, that if CARB has misgivings with this approach, MBAG recommends that CARB consider making a revision in a 15 day notice after the 2022 version of SAE J1772 is finalized. Commenter says this version should only apply to model year 2023 and beyond. [OP-120, 15-17]

Agency Response: Since the 2022 version of SAE J1772 is not yet finalized, the final adopted regulation cannot use it for incorporation by reference nor is it allowed to anchor a regulation to a floating reference that could be subsequently changed with an associated public rulemaking process. Accordingly, the adopted regulation references the most recent adopted version published which is the SAE J1772 REV OCT 2017.

Staff will continue to collaborate with SAE and industry to further refine any requirements or issues that newly arise and, as always with SAE documents that are updated after a regulation is adopted, will look to update regulatory references to the latest version at future regulatory reviews or revisions.

25. Comment: Commenter asks CARB to promote the use of swappable batteries in ZEVs to reduce the amount of time vehicles need to stop to get more energy before continuing. Much like the J1772 standard, CARB should develop a standard for swappable batteries to facilitate the adoption of this technology. [B1-19]

    Agency Response: The ACC II regulations establish standards for manufacturers to meet, including charging standards in section 1962.3, and do not promote any single technology such as battery swapping. Notably, these requirements do not require any single technology, but set a standard that manufacturers must meet by delivering for sale vehicles that produce zero emissions. This meets statutory requirements that encourage performance rather than prescriptive standards. If a ZEV is capable of battery swapping and can still meet standards set in section 1962.3, 1962.4, 1962.5, 1962.6, 1962.7, 1962.8, and 1969, then this would be acceptable for a vehicle to be certified and delivered for sale in California. Further, as directed by the Board in the resolution, staff will continue to monitor the progress of technology and industry in meeting consumer expectations and improving the experience for consumers to replenish the stored energy onboard. To the extent that technologies such as battery swapping further mature and show promise, staff will consider whether any changes are warranted to better allow, facilitate, or encourage such approaches. Staff is aware of past actions by Tesla to investigate this approach, current actions by a new entrant to the ZEV market, and discussions among several on-road motorcycle manufacturers to have a compatible battery across multiple makes and models and will continue to track progress as the technology evolves.

26. Comment: Commenter does not support the 15-day changes due to the increased electrical loads on the grid, violates Article 625.42 of the National Electrical Code (2020), a wide range of home electrical infrastructure capabilities, and a desire to integrate new electric vehicle load with renewables and demand response programs. Commenter is concerned that the proposed subsection 1962.3 if not modified could do more harm than good. [15-26]

    Agency Response: Regarding increased electrical loads on the grid, the ISOR and incorporated analysis of California's future electrical needs and demands can be achieved with continued but reasonable growth in renewable energy and, if needed, other electricity generation sources. The impact from an increased number of ZEVs is a very small minority of the increased demand projected as needed when transitioning residential and commercial buildings away from the use of fossil fuels such as natural gas. Regarding the alleged violation of Article 625.42, staff is unaware of any provision in title 13, CCR, section 1962.3 that would interfere with load management systems that are used on a circuit to further constrict usage by individual electrical consumption devices such as a vehicle plugged in for charging. In such circumstances, the load management device has ultimate authority to deliver reduced current despite what the electrical consumption device may be rated for or currently using. The assumption that dedicated Level 2 home chargers used in lieu of the convenience cord would provide access to additional features like timing charging to periods of renewable energy availability or reducing charging during peak demand is incorrect. While some dedicated Level 2 chargers may implement such features, many do not. Further, many vehicles already provide some form of these features, programmable in-vehicle or through an associated cell phone app, to allow users to schedule charging or otherwise start or stop timing as needed based on power events.

27. Comment: Commenter is concerned that the specifications of CARB's "charging cord" (or "convenience cord" as described in the Initial Statement of Reason) could put consumers, property, and vehicles at risk. Specifically, the user-selectable ability to adjust the amperage during (and presumably before) charging could be confusing to electric vehicle drivers unfamiliar with the electrical system at their place of residence or other location and appears to conflict with provisions of the National Electrical Code. [15-26]

    Agency Response: The required convenience cord is required to be tested as meeting the Underwriter Laboratory requirements, which necessarily mean that the cord self-recognizes the adapter in-use and will not allow charge rates in excess of what that particular cord plus adapter configuration is rated to safely handle. Consumers will not be at risk based on the specifications in the regulations. CARB also notes that upon providing further clarification to the commenter, the commenter provided amended comments prior to the second Board Hearing in support of the regulatory proposal. As discussed in the response to Comment H-26, the regulations do not conflict with the California Electrical Code or any provisions of the model National Electrical Code (which is adopted in many jurisdictions).