7373 Gateway Blvd, Newark, CA 94560

September 1, 2021

Marissa Williams, Joshua Cunningham, Mike McCarthy
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Lucid Comments on August 11, 2021 Advanced Clean Cars II Workshop

Dear Ms. Williams, Mr. Cunningham, and Mr. McCarthy:

Lucid Motors appreciates the opportunity to comment on the August 11, 2021 Advanced Clean Cars II (ACC II) workshop. We are a California-based electric vehicle manufacturer, with headquarters in Newark, CA, bringing an "absolute mic drop"[1] of a car to market this fall. The Lucid Air is the world's most powerful and efficient electric sedan, with a projected range exceeding 500 miles, the fastest recharge speed in the industry (350 kW), and the first mass-produced light-duty vehicle to support vehicle-to-grid functionality.

We have a clear vision for transitioning our market-leading technology to mainstream market segments and other transportation segments. Importantly, our technology leadership – especially on efficiency – will be key to electrifying medium and heavy-duty sectors and unlocking low-cost, mass market, uncompromising zero emission vehicles (ZEVs) to enable the complete and quick transition to zero emissions transportation.

CARB should more than double the initial stringency of the ACC II requirements.

In our comments related to the May workshop, we suggested four underlying principles for designing the ACC II regulation:

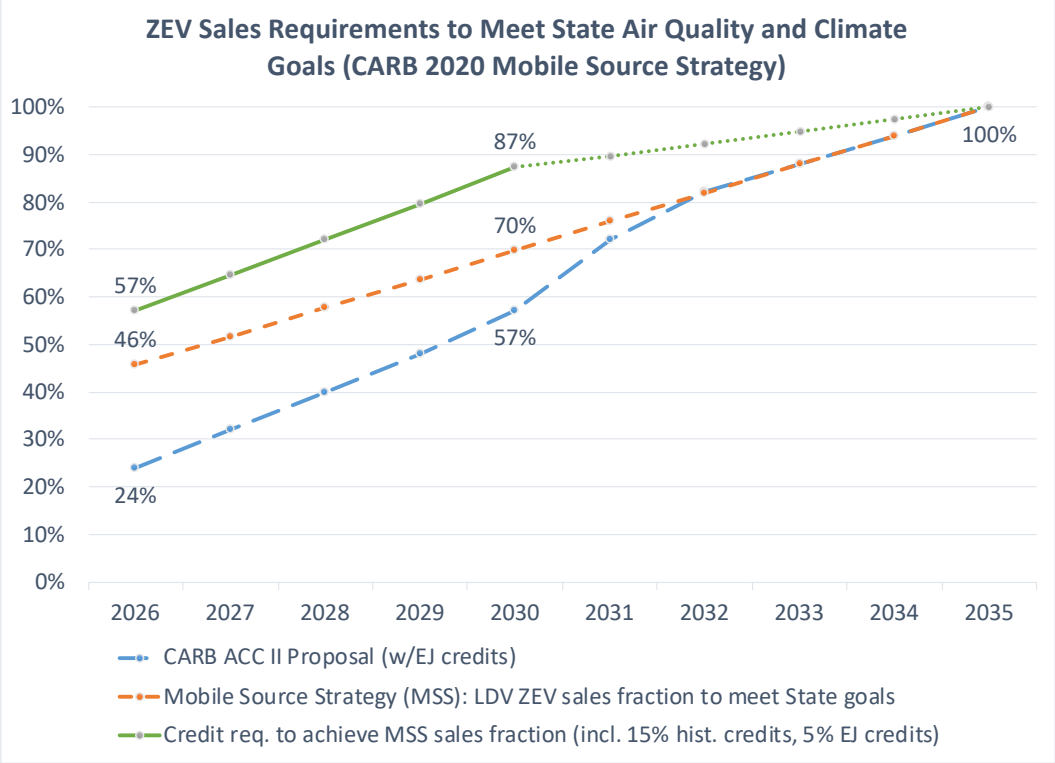
1. The ACC II regulations should be guided by the State's prevailing air quality and climate obligations, which require as much or even more focus on driving ZEV sales in the 2021-2026 timeframe as they do achieving 100 percent ZEV sales by 2035.
2. Transitioning to 100 percent ZEV sales requires designing the regulation around no-compromise solutions.
3. Efficiency matters, even for ZEVs, and should be an underpinning metric of ACC II.
4. Support and maintain a competitive ZEV market that drives continual innovation.

We hope CARB and a broad array of stakeholders agree with these underlying principles, especially the first – that the ACC II regulation should align with requirements to meet the

[1] Lieberman, J. (2021) "2022 Lucid Air Dream Edition R Exclusive First Drive: An Absolute Mic Drop," *MotorTrend*, August 25. https://www.motortrend.com/reviews/2022-lucid-air-dream-edition-r-exclusive-first-drive-review/

state's air quality and climate change targets. CARB has clearly laid out in its Mobile Source Strategy ZEV sales fractions needed between now and 2030 and beyond in the light-duty sector to put us on track to meet federally mandated air quality targets and our 2030 climate target under SB 32.[2]

Unfortunately, the current proposal falls far short of meeting these requirements, and the EJ crediting scheme, in its current form, would take us even farther off the path (see figure below). CARB's proposed sales requirement in 2026, for example, is about half of the levels identified in the Mobile Source Strategy as needed to meet our environmental goals. When accounting for the potential for banked credits and EJ credits, the credit requirement at the start of the program in 2026 would have to be well over double that of the current proposed stringency, to put the state on track to meet its climate and air quality goals.



Assuming average annual new car sales of 2.1 million vehicles and linearly extrapolating current sales levels to those in 2026 for each of the scenarios, we estimate that the current ACC II proposal could miss cumulative 2021-2030 ZEV sales requirements as identified in the Mobile Source Strategy *by nearly 4 million vehicles*. This outcome would put us well behind current climate targets, let alone accelerated climate targets for 2030 and carbon neutrality in California that CARB is currently evaluating in the 2022 Scoping Plan Update.[3]

[2] See Figure 13 in: CARB (2021) Revised Draft 2020 Mobile Source Strategy, California Air Resources Board, April 23. https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf

[3] https://ww2.arb.ca.gov/sites/default/files/2021-08/carb_presentation_sp_scenarioconcepts_august2021_0.pdf

7373 Gateway Blvd, Newark, CA 94560

CARB should accelerate rapid, mass-market adoption and equitable outcomes by driving efficiency improvements (and therefore cost reductions and range improvements) and requiring no-compromise ZEV solutions.

While we don't agree with all the ZEV assurance measures CARB has proposed – especially the provisions that might expose vehicles and consumers to cyberthreats – we appreciate and strongly agree with the sentiment that CARB should ensure that ZEVs can fully replace gasoline vehicles for consumers.[4] Requiring ZEVs to serve as no-compromise, and ultimately value-added, solutions to conventional vehicles is the only way to meet the goal of 100 percent ZEV sales and will serve to rapidly accelerate the market and advance equitable outcomes.

CARB should assume, expect – and require – the ZEV market to reach the point where mass-market, no-compromise solutions are widely available at the start of the regulation in 2026. In addition to setting minimum range and fast charging requirements, CARB should set minimum efficiency requirements for ZEVs to advance these objectives. Improving the efficiency of ZEVs advances similar emissions, energy use and national security objectives that have always driven vehicle emissions policies in the past. Importantly, it also has the same impact on vehicle cost as reductions in battery prices do (see table below), but is a parameter that CARB can directly control through the design of the ACC II regulation. Ultimately, both low battery costs and high ZEV efficiency are needed to achieve the low-cost, long-range, no-compromise ZEVs that are needed to achieve 100 percent ZEV sales and meet the state's climate and air quality targets.

Table 1. Battery pack costs for 350-mile range ZEV, based on efficiency and battery costs.

Battery costs ($/kWh)	Efficiency (miles/kWh)				
	2	3	4	5	6
140	$ 24,500	$ 16,333	$ 12,250	$ 9,800	$ 8,167
120	$ 21,000	$ 14,000	$ 10,500	$ 8,400	$ 7,000
100	$ 17,500	$ 11,667	$ 8,750	$ 7,000	$ 5,833
80	$ 14,000	$ 9,333	$ 7,000	$ 5,600	$ 4,667
60	$ 10,500	$ 7,000	$ 5,250	$ 4,200	$ 3,500

Expecting and requiring long range, fast recharge times, and efficient ZEVs is the fastest way to drive innovation, market-wide adoption, and equitable outcomes. CARB can further advance these objectives by providing credit multipliers for exceptionally efficient ZEVs and other items that advance the consumer or ZEV proposition, such as vehicle-grid capabilities.

[4] See, for example, slide 14 from the August workshop: https://ww2.arb.ca.gov/sites/default/files/2021-08/ACC%20II%20August%202021%20Workshop%20Presentation.pdf

7373 Gateway Blvd, Newark, CA 94560

CARB should increase minimum range requirements to 350 miles, require 350kW charging capabilities, and incorporate minimum efficiency requirements.

We strongly support the notion of minimum requirements for generating a single ZEV credit, and we encourage CARB to set those minimum requirements such that a ZEV generating a single credit would offer a no-compromise solution to a conventional vehicle.

In particular, we feel that a 150 mile label range is far too low for the ACC II regulation. At the workshop, CARB staff described the intention as ensuring at least 100 miles useful range after 15 years. This is a far cry from ensuring ZEVs can fully replace gasoline vehicles for all consumers, and we can hardly imagine a driver in 2040 being satisfied with car with 100 miles range. This is incompatible with the notion of completely transitioning to ZEVs over that timeframe.

CARB's regulations should clearly drive the whole market forward, rather than accommodating the lowest performers. We encourage CARB to adopt minimum range requirements of 350 miles by 2026, which would ensure comparable performance to conventional vehicles and is consistent with recent and continued trends in the industry. As presented at the workshop (slide 39), for example, the median range of electric cars sold in California *in 2018* was 310 miles and the sales-weighted average range was 276 miles.

Additionally, we encourage CARB to set minimum requirements for charge times, by requiring 800+ V architectures that would allow charging at, or near, 350 kW (7 times greater power than conventional 50 kW fast charging today). Again – the industry is already moving in this direction and its inclusion is a necessary element of ensuring no-compromise vehicles capable of transitioning all drivers and applications to ZEVs. Encouraging faster charging will also support build out of a more functional - and cost-effective - fast charging network that could charge more cars, more quickly, with fewer chargers. Such a requirement would *reduce the cost of infrastructure* needed to support the complete transition to ZEVs while providing added value for drivers.

Finally, and perhaps most importantly, we encourage CARB to add minimum requirements for ZEV efficiency that would increase over time. We recommend a footprint-based standard that would begin in 2026 at levels similar to leading performance today (for example, 3 miles/kWh for large SUVS and 4 miles/kWh for sedans), and would improve in-line with conventional vehicle efficiency over time (that is, 2-5 percent per year). This requirement alone would drive significant cost reductions in ZEVs, support longer minimum range requirements, reduce operating costs for drivers, and reduce the overall environmental impact associated with the ZEV supply chain and passenger transportation.

7373 Gateway Blvd, Newark, CA 94560

To the extent CARB wants to accommodate lower-functioning ZEVs, it should do so through partial crediting, rather than setting lower minimum standards for a full credit.

Achieving 100 percent ZEV sales is best supported by CARB clearly driving the whole market to no-compromise ZEV solutions, with minimum requirements that ensure the average ZEV sold in 2026 and beyond will be able to replace the primary vehicle for most, if not all households. Still, we recognize the possibility of scenarios where suboptimal vehicles may have utility or when customers may be willing to settle for less.

Rather than excluding them from the market, we encourage CARB to offer partial (that is, <1.0) credit for ZEVs with lower range, slower recharge times, or low levels of efficiency. For range and efficiency, CARB should scale credits based on the parameter of interest. For example, if minimum requirements for one credit are 350 miles range and 4 miles/kWh, a vehicle with 175 miles range or 2 miles/kWh would receive half credit. CARB could cap the minimum credits generated at 0.5, so that a vehicle with both 175 miles and 2 miles/kWh would still receive 0.5 credits (instead of 0.25). Vehicles with less than 350 kW charging capabilities could receive partial credit – for example, 0.8 or 0.9 credits maximum – although we strongly suspect these vehicles would have limited range that would lead to additional scaling down of credits.

What CARB should not do is set the standard of the regulation at a less-than-fully functional ZEV. This would discourage innovation and sets an expectation that ZEVs cannot offer comparable performance to gasoline vehicles. And it would directly contradict the direction of the state, and the market, to transition completely to zero emission vehicles.

Equity is best and most broadly advanced with stringent standards that maximize near-term ZEV deployment, drive no-compromise solutions and accelerate cost reductions through a focus on efficiency.

We appreciate CARB's focus on equity and proposals around EJ crediting. We think these are creative solutions and agree that credit multipliers and adjustments can – and in limited situations, should – be used to achieve targeted outcomes, including related to equity and environmental justice.

As described in this letter, we believe equity and emissions outcomes will be best and most broadly served by standards that align with sales requirements to meet the state's climate and air quality goals, a focus on ZEV efficiency, and minimum ZEV requirements that will together deliver greater near-term emissions benefits and drive innovation in the auto industry to most quickly deliver no-compromise, cost-effective and mass-market ZEV options. Regardless of specific crediting mechanisms targeted at low income drivers or disadvantaged communities, we encourage CARB to look at the whole of the regulation through an equity lens – which we believe supports the recommendations included in this comment letter.

To the extent CARB includes enhanced credits for environmental justice programs, it should avoid doing so at the expense of overall environmental benefits associated with the program. CARB should adjust the stringency of the overall program to ensure similar statewide emissions reductions as would be achieved without those provisions, which should at least align with the sales trajectory identified in the Mobile Source Strategy.

Regarding the specific proposals presented at the workshop, we encourage CARB to apply minimum requirements for used-car credits that represent no-compromise ZEVs. This would be best served with overarching minimum requirements that include 350 miles of minimum range and efficient ZEVs. However, if CARB were to adopt rules with lower minimum requirements, as proposed at the workshop, we encourage CARB to adopt more stringent requirements for vehicles generating used ZEV credits. It's hard to imagine how equity is advanced if used ZEVs with the shortest range and most limited functionality are to be the vehicles ascribed to low-income drivers and disadvantaged communities.

CARB's environmental and economic analysis should consider scenarios that achieve better cost and environmental outcomes, including the sales trajectory in the Mobile Source Strategy and excluding PHEVs, as well as scenarios where ZEV efficiency is a fundamental aspect of the regulation.

Electric vehicles are widely expected to reach cost parity with conventional vehicles in many light-duty segments before 2026 and in most this decade.[5,6] Multiple studies show significant cost savings and economic benefits associated with a rapid transition to ZEVs.[7,8] (These studies don't account for lower oil prices associated with a widescale transition to ZEVs, which delivers additional economic benefits and cost savings for those still driving conventional vehicles, as well,[9] and which CARB should incorporate into its economic analysis of the regulation.) Suffice to say, analyses evaluating the economic and environmental benefits associated with selling more ZEVs in 2026 and beyond should only show both economic and environmental benefits.

We strongly encourage CARB to appreciate this reality and design a strong regulation that at least aligns with the sales trajectory in the Mobile Source Strategy. Even then, CARB should evaluate more aggressive ZEV sales scenarios, including achieving 100 percent ZEV sales by 2030, at which point electric cars in all segments are expected to have reached cost parity with conventional vehicles. If CARB sets regulations at levels lower than those identified in the Mobile Source Strategy, it should evaluate the outcomes in the Mobile Source Strategy as well as accelerated scenarios for achieving 100 percent ZEV sales.

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[5] https://theicct.org/publications/update-US-2030-electric-vehicle-cost
[6] https://about.bnef.com/blog/the-ev-price-gap-narrows/
[7] Brown, A. et al (2021) Driving California's Transportation Emissions to Zero, University of California Institute of Transportation Studies, April. https://escholarship.org/uc/item/3np3p2t0
[8] https://www.2035report.com/transportation/
[9] https://theicct.org/sites/default/files/publications/Oil%20Market%20Futures_Summary_US_June%202016.pdf

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In previous comment letters, we have encouraged CARB to exclude PHEVs from the regulation, as they are incompatible with a 100 percent ZEV future. PHEVs are now the embodiment of incrementalism: delivering worse environmental outcomes at higher cost for marginal perceived benefits, if any. And by definition, the rationale for PHEVs fades once the market and state develop zero-compromise ZEVs and the infrastructure to support them – which is a pre-requisite to meeting Governor Newsom's Executive Order and the proposed ACC II regulations. In its economic and environmental analyses, we encourage CARB to explore scenarios for each set of sales trajectories (for example, proposed ACC II rules, Mobile Source Strategy trajectory, and 100 percent ZEV sales by 2030) that both include and exclude PHEVs.

Finally, we encourage CARB to explore scenarios that account for an explicit focus on ZEV efficiency, as identified in these comments, where CARB sets minimum thresholds for ZEV efficiency and increases them by as much as 5 percent per year from 2026 on. These scenarios would show more rapid cost declines for ZEVs, lower operating costs, lower emissions, lower total electricity demand and better environmental and economic outcomes on whole.

We look forward to seeing CARB's revised proposal in the fall.

Since the May workshop where the initial ACC II proposal was presented, California has again set new wildfire records and Governor Newsom has asked CARB to evaluate scenarios for achieving carbon neutrality no later than 2035. There is no question about the need for decisive and urgent action to mitigate the ongoing effects of climate change to the State and its citizens.

CARB's ACC II rule may present the best opportunity to quickly, significantly, and cost-effectively reduce emissions in the state. Passenger vehicles are by far the state's largest source of greenhouse gas emissions, and zero emission options will be cost effective from day one of enactment. We hope CARB will meet this pivotal moment with conviction and develop an ACC II rule that drives the market towards the performance, cost, and environmental outcomes we no longer just aspire to - but must - achieve.

Thank you again for the opportunity to comment on this workshop, and for your consideration of these comments.

Sincerely,

Daniel Witt
Head of State & Local Public Policy
Lucid Motors