



March 19, 2017

Chair Mary Nichols and Board Members
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Subject: ZEV numbers in California by 2025

Dear Chair Nichols and Board Members:

Last year the Natural Resources Defense Council (NRDC) released a report assessing the likely number of vehicles to be delivered in compliance with the Zero Emission Vehicle (ZEV) regulation.¹ The report concluded that given recent developments in vehicle technology and other factors, the expected number of vehicles was likely to be substantially less than originally estimated by ARB staff in the 2012 ZEV rulemaking. Since that time the ARB staff has released its midterm review of California's Advanced Clean Cars program, which similarly noted that "As a result of the vehicle technology advancements evident in the market, new minimum compliance scenarios were developed that project approximately 1.2 million cumulative sales of ZEVs and PHEVs by 2025 in California"² which translated to an 8 percent sales share in 2025.³ Most recently, the Auto Alliance has released the results of an analysis that it commissioned from Sierra Research, which "forecasts substantially higher ZEV sales volume requirements than those found by NRDC"⁴ (and, by extension, than those found by ARB staff), which translated to about a 10 percent sales share in 2025.⁵

I am writing to provide our comments on the Sierra Research report. We asked Shulock Consulting, who did the modeling work underlying our original report, to review the Sierra Research work. My remarks here are based on his technical analysis and assumption comparisons, but reflect NRDC policy position. In brief, several of the Sierra Research

¹ Manufacturer Sales Under the Zero Emission Vehicle Regulation: 2012 Expectations and Governors' Commitments Versus Today's Likely Outcomes, prepared by Shulock Consulting for the Natural Resources Defense Council, July 21, 2016.

² California's Advanced Clean Cars Midterm Review: Summary Report for the Technical Analysis of the Light Duty Vehicle Standards, California Air Resources Board, January 18, 2017, page ES-7.

³ ARB 2017 ZEV Calculator; <https://arb.ca.gov/msprog/zevprog/zevcalculator/zevcalculator.htm>

⁴ January 13, 2017 letter from Steven Douglas to Chair Mary Nichols and Board Members

⁵ Based on annual ZEV sales estimated from Figure 7 in the Sierra Research report as a percentage of annual LDV sales per CNDCA as shown in Table 2.



adjustments to the assumptions used in the NRDC report result in a highly optimistic and a fairly inflated view of the expected number of vehicles. These assumptions include what would amount to record California vehicle sales through 2025 and lower-than-expected future electric vehicle performance, along with other factors. In combination, this seemingly “perfect storm” scenario seems highly unlikely. As a policy matter, the Board’s consideration should focus on the likely volumes under conservative assumptions given the need for the ZEV program to provide a sales floor.

More conservatism is particularly warranted given that neither the NRDC nor the Sierra Research modeling take into account the potential impact of Tesla sales on the supply of ZEV credits. For example, NRDC’s scenario only assumed that Tesla sales remain flat for 2015 and beyond at roughly 10,000 vehicles per year. As you are aware, Tesla has received some 373,000 pre-orders for the Model 3.⁶ Various reports suggest that roughly 45 percent of Tesla sales have been in California.⁷ Applying that same percentage to the Model 3 preorders would result in about 168,000 vehicles for California.

That single model, from a single manufacturer, would generate more than enough ZEV credits to satisfy the entire projected Large Volume Manufacturer (LVM) ZEV obligation for model years 2020, 2021, 2022 and 2023 combined. In terms of vehicles offset, using the Sierra Research assumption of an average of 2.5 credits per ZEV over the compliance period, the supply of Tesla credits is equivalent to offsetting about 269,000 vehicles from other automakers. Including Tesla credit sales into the equation would result in OEM obligations being even less than the 10% sales required by 2025 under the Sierra Research analysis.

This total does not include any ongoing Model 3 sales beyond the pre-orders, nor does it consider sales of other Tesla vehicles or other new market entrants. Even if the pre-orders do not all result in sales, it is clear that this one factor alone has the potential to dwarf other considerations and should be carefully considered in policy deliberations.

We look forward to working with the Air Resources Board on continuing to make further progress on electrification of the transportation sector and to account for the issues raised in our study in future updates to the ZEV program.

The attached report outlines our comments in more detail.

⁶ <https://www.bloomberg.com/news/articles/2016-05-18/tesla-says-12-200-model-3-orders-were-cancelled>

⁷ <http://insideevs.com/california-leads-nation-in-tesla-model-s-sales-but-which-other-states-are-in-top-10/>



Sincerely,

A handwritten signature in dark ink that reads "Simon C. Mui".

Simon Mui
Director, California Vehicles and Fuels, Energy & Transportation Program
Natural Resources Defense Council

cc: Richard Corey
Alberto Ayala
Annette Hebert
Michael McCarthy
Analisa Bevan
Joshua Cunningham
Shobna Sahni
Anna Wong

NATURAL RESOURCES DEFENSE COUNCIL

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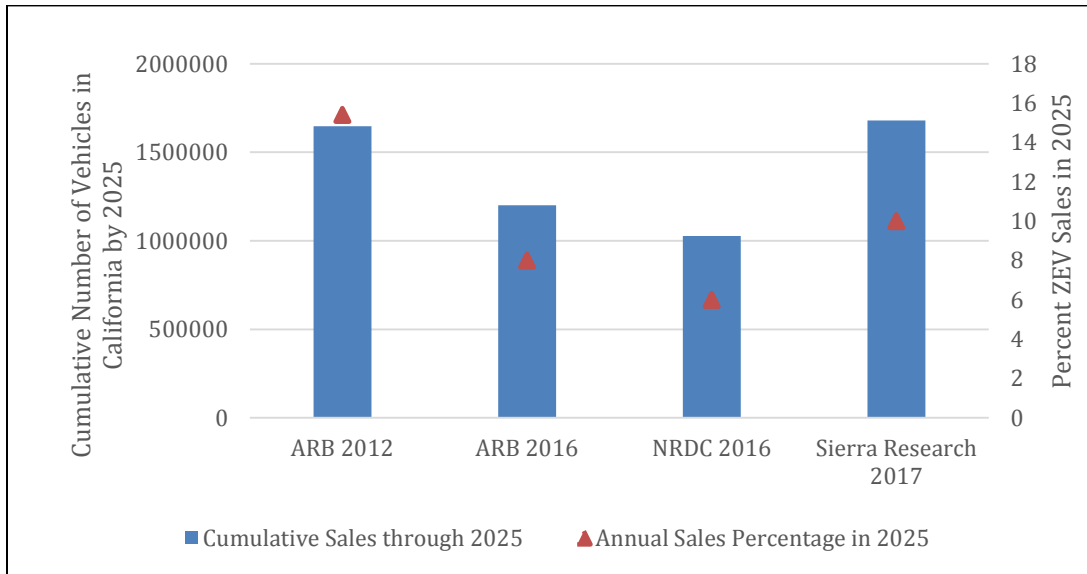
Manufacturer Sales Under the Zero Emission Vehicle Regulation: Review of Sierra Research Adjustments

Overview

This document reviews and comments on several of the assumptions used in the Sierra Research report entitled “**Zero Emission Vehicle Populations Under CARB’s Advanced Clean Cars Program.**” Before commenting on the Sierra Research assumptions, however, we are pleased to report that their calculation methodology and our own yield generally consistent results given the same assumptions. Figure 2 in the Alliance letter shows what they characterize as “very good agreement” between the NRDC results and the Sierra Research recreation of those results with their independent model. Our consultant similarly compared the Sierra Research results to the results obtained using the NRDC model with the Sierra Research assumptions, and found good agreement. Given the complexity of the ZEV regulation and the many variables involved, this is noteworthy and means that going forward the debate among the parties should be able to focus on the technology assumptions and implications of possible policy changes rather than on arguments about how to calculate the impact.

To put the Sierra Research results in context, Figure 1 below compares various estimates of the cumulative number of ZEVs and TZEVs by 2025. It replicates Figure 1 from the Sierra Research report, but also includes the most recent ARB estimate, noted above, drawn from the Advanced Clean Cars Midterm Review. It also shows, for each source, the estimated annual ZEV sales fraction in 2025. As can be seen, the Sierra Research estimates are well in excess of both NRDC and ARB.

Figure 1
Number of ZEVs and TZEVs Forecast in California by 2025



Sierra Research Adjustments

Turning to the details of the Sierra Research work, Table 1 shows the Sierra Research individual adjustments and their reported impact on the number of vehicles and/or usage of banked credits, as compared to NRDC. As noted in their report, in some instances the adjustments taken individually do not affect the number of ZEVs but rather draw down the number of banked ZEV credits available at the end of the 2025 model year.

Table 1
Sierra Research Adjustments

Adjustment	Impact versus NRDC results		
	Number of Vehicles		Credit Balance
	ZEVs	TZEVs	
1. IVMs Comply with only TZEVs (no BEVs or FCVs)	0	+60,000	-124,000 ZEV
2. Higher Sales Level through 2025	0	+120,000	-200,000 ZEV
3. US06 Credit for TZEVs	0	+25,000	0
4. BEV Range	0	0	-169,000 ZEV
5. Maintain 2 Year Credit Balance	+45,000	+200,000	-180,000 ZEV -225,000 TZEV

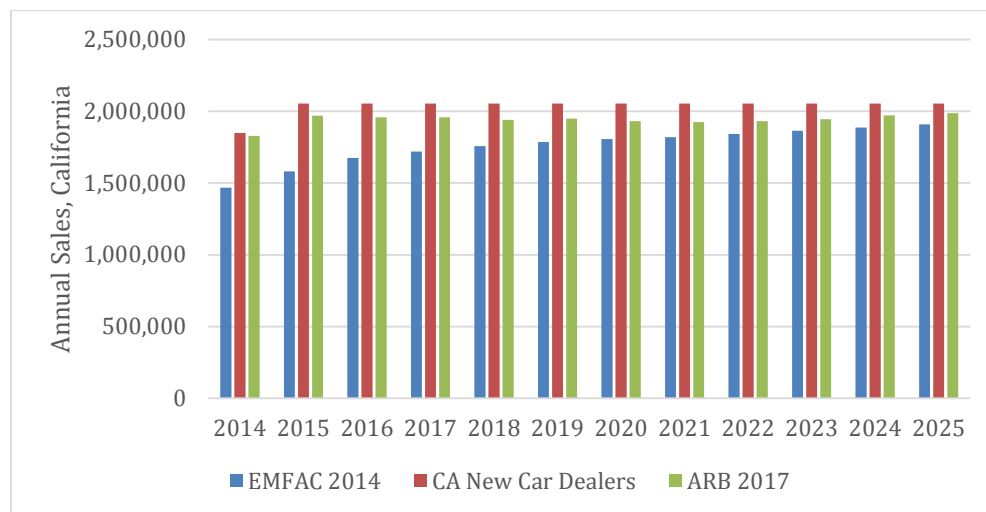
Our response will focus on items 2, 4 and 5, both because they have the largest impact and because of the nature of the adjustments.

Actual Sales Data

The NRDC estimate uses EMFAC 2014 as the source for projected California light duty vehicle sales, because at the time our analysis was prepared EMFAC 2014 was the data source being used by ARB for its calculations. Sierra Research uses sales data from the California New Car Dealers Association, and assumes that the 2015 sales level will be maintained for all years going forward.

The new ARB 2017 estimate takes national sales from the Annual Energy Outlook 2015 and assumes that California sales are 12 percent of the national total. The results obtained using the three sources are compared in Figure 2 below. We note that it may be more important to focus on the annual percent sales share going forward, rather than absolute cumulative vehicle numbers, since the latter is significantly affected by assumptions on future sale trends.

Figure 2
Assumed Annual Light Duty Vehicle Sales in California

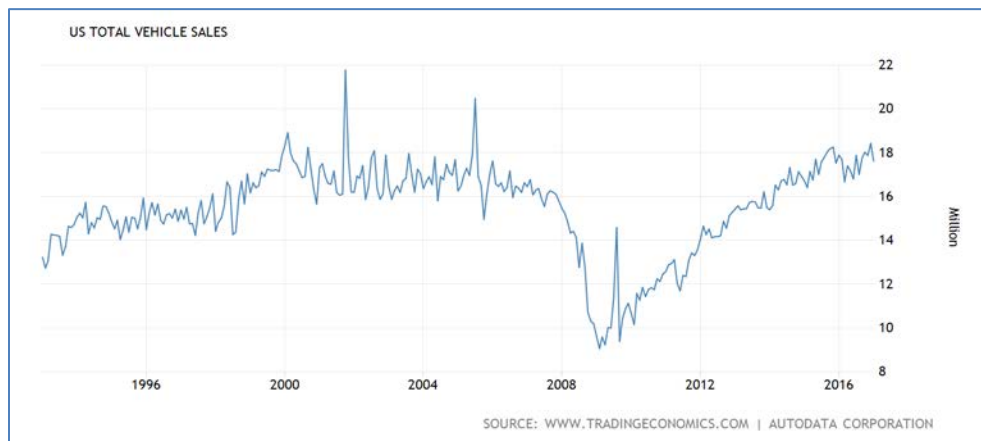


As can be seen in Figure 2, the ARB methodology provides higher totals than EMFAC 2014, which alone explains some of the higher cumulative numbers ARB's updated scenario shows compared to NRDC. Sierra Research's estimate is highest of all. Using the ARB 2017 sales estimate rather than the Sierra Research estimate in the NRDC model reduces the impact of this change by about 37 percent and about 35,000 vehicles.

While the New Car Dealers and ARB methodologies reflect recent sales trends, it is important to bear in mind that car sales are cyclical and as recently as 2009 were substantially lower than current levels. We note that in 2015, auto sales hit a record level not seen in 15 years and that even the National Auto Dealers Association believes this will fall soon, stating, “This is a cyclical industry, and there is no escaping the consumer cycle.”⁸

According to Trading Economics, total vehicle sales in the United States averaged 15.46 million from 1993 until 2017, reaching an all-time high of 21.77 million in October of 2001 and a record low of 9.05 million in February of 2009.⁹ Figure 3 below shows national sales data for 1992 through 2017.

Figure 3
Total United States Passenger Vehicle Sales



Applying the 12 percent ARB California fraction to the national annual long term average of 15.46 million results in average California sales of 1.86 million. The annual average over the same period for EMFAC 2014 is 1.76 million, for the ARB 2017 estimate is 1.94 million, and for the Sierra Research estimate is 2.04 million. Thus the ARB and Sierra Research projections both exceed the long term annual average.

BEV Range

Sierra Research assumes lower BEV range, which results in a larger number of vehicles. Figure 4 below compares the BEV range assumed for 2018 through 2025 by NRDC, Sierra Research, and the “Mid-Range” technology case in the ARB ZEV calculator, along with

⁸ <http://www.latimes.com/business/autos/la-fi-peak-auto-sales-20150702-story.html>

⁹ <http://www.tradingeconomics.com/united-states/total-vehicle-sales>

2021 through 2025 estimates from the U.S. EPA Midterm Evaluation¹⁰. Two EPA estimates are shown—the “calculated” range which reflects the sales-weighted average range determined by the EPA technical analysis, and the EPA “OMEGA” range which was used “to account for a potential slower-than-historical increase in range and to be consistent with an existing technology package in OMEGA” (the USEPA modeling tool). Sierra Research states that it uses a 5 percent annual range increase factor, to be consistent with ARB and USEPA modeling, but as Figure 4 illustrates they use a much lower 2018 starting position (115 miles for Sierra Research as opposed to 150 for ARB) which results in much lower estimated range throughout the compliance period.

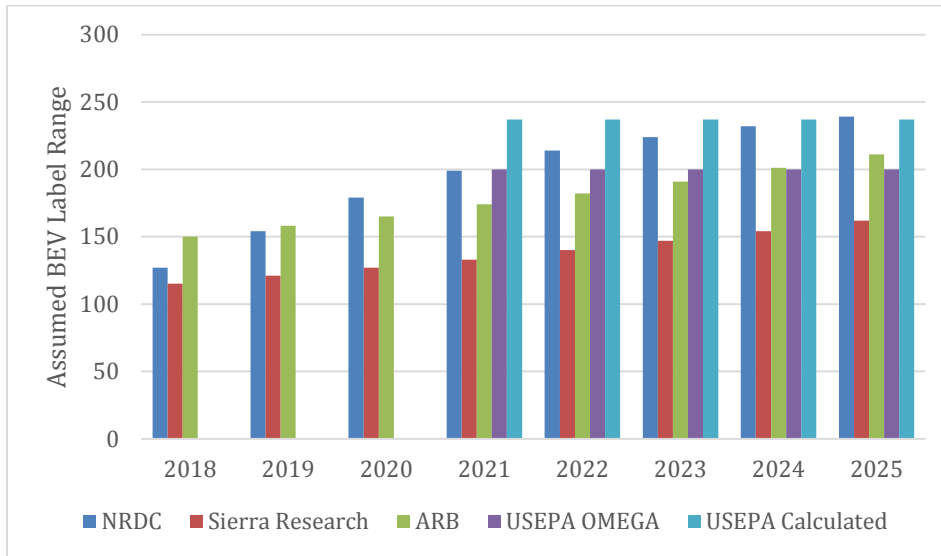
The 115 mile (real-world) range assumption for BEVs in 2018 is already being far exceeded by automakers with their new product offerings this year (e.g. Chevy Bolt). Sierra Research’s use of this low range value translates into a far larger impact on the ZEV credit balance than likely will occur given automaker’s stated product offerings, NRDC’s model-by-model analysis based on product forecasts by Alan Baum & Associates, and ARB’s and EPA’s own technical assessment reports.

Auto Alliance’s own members – as well as other automakers with headquarter in Europe and Asia - have made public statements about future model offerings that even exceed 300 miles (for example, “Ford Says a Fully Electric SUV with 300 Miles of Range Is Coming by 2020”).¹¹

¹⁰ USEPA, Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025, page 4-48.

¹¹ <http://blog.caranddriver.com/ford-says-a-fully-electric-suv-with-300-miles-of-range-is-coming-by-2020/>;

Figure 4
Assumed BEV Range



Two Year Minimum Credit Balance

The Sierra Research modeling increases vehicle sales such that at the end of the 2025 model year manufacturers retain banked ZEV and TZEZ credits that are sufficient to provide a two-year compliance cushion. The NRDC modeling did not impose any retained credit requirement, but the base case resulted in retained 2025 ZEV credits sufficient to provide a two-year balance. So this change would have no impact on the number of ZEVs. We agree that TZEZ sales would need to be increased in order to generate retained TZEZ credits in 2025.

Conclusion

We appreciate that the Auto Alliance sponsored a careful review of the NRDC work, and as noted above it is useful to learn that the modeling tools appear to give consistent results. Nonetheless we continue to argue that on balance the NRDC work provides a far more reasonable assessment of future prospects.

The Sierra Research report concludes that their various adjustments, taken in combination, would result in cumulative sales by 2025 of more than 1.6 million ZEVs and TZEZs, as opposed to the roughly 1 million projected by NRDC and the 1.2 million projected by ARB staff. As shown here, several of the assumptions used by Sierra Research are inconsistent with those used by ARB and USEPA. Moreover, none of the modeling takes into account the



impact of Tesla sales, which could generate ZEV credits sufficient to completely offset the OEM ZEV obligation for a number of years.

The Sierra Research report also includes a higher estimate of ZEV sales that would result if the regulation were modified to allow greater reliance on TZEVs for compliance purposes. This is a policy matter outside the scope of our review, and is not discussed here other than to note that, as we have raised in the past, a greater reliance on TZEVs would result in reduced numbers of ZEVs absent additional modifications to the stringency of the standard.