

# **Potential Loopholes in the Proposed ZEV Program Amendments**

Natural Resources Defense Council  
Union of Concerned Scientists

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## Executive Summary

The Zero Emission Vehicle (ZEV) program is complex and difficult to manage. In the past, well-intentioned changes to the regulation have reduced the effectiveness of the program and opened loopholes that allow auto manufacturers the opportunity to fulfill their requirement with little advancement in technology. We are recommending nine changes to the proposed ZEV Staff Report that will strengthen the program and eliminate the opportunities for “gaming the system”. These recommendations include:

1. Limit Hydrogen Internal Combustion Engine Vehicles to AT-PZEV (non-Enhanced) and PZEV credits due to their limited benefit and potential for gaming.
2. Extend Carry Forward provision to Enhanced AT-PZEVs to ensure that banked credits do not create long “blackout” periods when none of these vehicles are produced.
3. Limit Travel Provision for Type III and IV ZEV to 2014 because increased volumes in the pre-commercialization phases after 2015 are necessary to encourage expansion and cost reduction in component and infrastructure suppliers.
4. Raise performance requirement for Type IV ZEV to a level that is not already exceeded by the recent models of fuel cell vehicles on the road today. Also, ensure the new class does not result in a decrease of pure ZEVs required in Phase II.
5. Eliminate extension of Type C Hybrid Electric Vehicle (HEV) because it is an off-the-shelf technology that offers limited benefit to advancing technology.
6. Place 50% cap on the use of Type I and I.5 ZEV that do not use advanced batteries and limit their Travel Provision to 2011 because they have limited long-term benefits and open a program loophole.
7. Quantitatively define the term “Advanced Battery” to reward production of truly new technologies as opposed to high power nickel-metal hydride batteries available in today’s mass market hybrids.
8. Prevent product blackouts caused by NEV credits for the pure ZEV minimum requirement and early introduction of Enhanced AT-PZEVs. This can be accomplished by limiting the use of NEV credits earned before 2008 to the (non-Enhanced) AT-PZEV or PZEV categories after 2011 and restricting NEV credits earned after 2008 from the pure ZEV floor.
9. Modify six year extension of Intermediate Volume Manufacturer (IVM) timeline as this increases the time these manufacturers have to comply with the program to twelve years.

We recommend the ARB Staff adopt these changes to strengthen the ZEV Program by advancing technology and eliminating loopholes.

# Recommended Changes to Strengthen ZEV Program

## **1. Limit Hydrogen Internal Combustion Engine Vehicles to AT-PZEV or PZEV Credits Only**

At the low vehicle volumes proposed for Enhanced AT-PZEVs in the Initial Statement of Reasons (ISOR), hydrogen internal combustion engine vehicles (H2ICE) are unlikely to significantly push hydrogen infrastructure development. Additionally, these vehicles fail to push ZEV technology because their drivetrain is not electrified. However, according to the ISOR credit scheme a H2ICE receives more credits than a plug-in hybrid vehicle (PHEV) with 20 miles equivalent all-electric range (EAER); it takes just 2 H2ICEs to backfill a Type III pure ZEV or less than two H2ICEs to backfill a Type II BEV with over 100 miles of range.

Also concerning is the fact that H2ICE presents auto manufacturers with a low cost alternative to gain credits with minimal investment in ZEV technologies. To determine how much it costs to convert a convention gasoline vehicle to a compressed gas H2ICE, we looked at a real world example of this type of conversion: the compressed natural gas (CNG) Honda Civic GX. The MSRP cost of a CNG Civic GX is \$6,800 more than a comparable gasoline Civic LX. The cost of converting a hydrogen vehicle is slightly more because of the higher pressure and nature of hydrogen. However, the price difference in the gasoline and CNG Civic is a retail price, and the cost of conversion to the manufacturer is significantly less.

So for \$6800 or less, an auto manufacturer can convert an existing gasoline vehicle to H2ICE and receive 2.3 Enhanced AT-PZEV credits. A 20 mile EAER plug-in hybrid vehicle receives only 1.99 credits, but has an incremental cost of \$25,000 based upon the ARB ISOR. Thus, for a fraction of the cost of converting a H2ICE vehicle, the auto makers can receive more credits than an aggressive PHEV.

Even the ARB Independent Expert Panel reporting on the ZEV program recognized "... that if the relative incentives change there could be a shift in resources away from FCEV development to fund H2ICEs."<sup>1</sup> Therefore, we propose that H2ICE be limited to fulfill (non-Enhanced) AT-PZEV or PZEV credits only, because they do not offer the same technology advancement benefits of two fuel cell or two full battery electric vehicles.

## **2. Extend Carry Forward Limit to Enhanced AT-PZEV**

ARB Staff should extend the Carry Forward to Enhanced AT-PZEVs until they are commercialized in mass (100,000s vehicles placed/year). Extending Carry Forward to Enhanced AT-PZEVs is consistent with the ARB Staff proposal to limit the future use of credits for pure ZEV vehicles still in the demonstration or early commercialization phases. According to the ISOR, the Carry Forward provision was introduced "to help alleviate the possibility of long blackout periods during which pure ZEV production is curtailed..." The provision limits credits earned through 2008 and earlier from being used past 2011. Credits earned in model year 2009

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<sup>1</sup> California Air Resources Board Independent Expert Panel. 2007. *Status and Prospects for Zero Emission Vehicle Technology*. Sacramento, CA. April.

can be carried forward for pure ZEV credit for only two additional years. This same policy should apply to Enhanced AT-PZEVs.

Without the Carry Forward limitation, automakers placing small numbers of demonstration or early commercialization vehicles could easily increase placements in one year, then bank credits and avoid production in later years. With Enhanced AT-PZEVs in the pre- and early commercialization phases from 2012 to 2014, they have the same risk of product blackout that is recognized for pure ZEVs during that time. The risk of blackouts is more severe for Enhanced AT-PZEVs in the 2015 to 2017 timeframe because the volume requirements for these vehicles increase only slightly (25,000/year from 2012-2014 to 28,000/year from 2015-2017). If manufacturers choose to build Enhanced AT-PZEVs in Phase II (when a three times early introduction multiplier applies) or over-comply in Phase III the result could be very few or no vehicles being produced in Phase IV. Enhanced AT-PZEV volumes in Phase III and Phase IV face an additional risk of blackout because ISOR pure ZEV requirements are so low. Without the Carry Forward limitation, automakers could build low volumes of pure ZEVs to meet Phase III requirements and then use credits banked from Phase II or earlier to meet the Enhanced AT-PZEV requirement.

We strongly recommend that ARB extend the Carry Forward provision to Enhanced AT-PZEVs at least through Phase III and Phase IV.

### ***3. Limit Travel Provision Extension on Type III and IV ZEV to 2014***

The end of the Travel Provision means that the auto companies must meet the ZEV regulations in California and the ten other states that have adopted the ZEV regulations. This essentially doubles the number of Type III and IV ZEVs the auto companies have to produce across the nation. For example, during Phase IV, the Staff is proposing to require 25,000 pure-ZEVs in California only. However, the current regulations, plus eliminating the Travel Provision means the auto manufacturers have to produce 100,000 vehicles nationally.

ARB Staff justifies this large reduction in pure-ZEV numbers by saying the increase would "hinder the ability of auto manufacturers to bring these vehicles to markets". During Phase III, when the vehicles are in a demonstration phase, this justification might be true. However, extending the Travel Provision into the pre-commercial stage (Phase IV) would inhibit future growth by limiting supplier opportunities, reducing infrastructure, and increasing per vehicle costs. Finally, extending the Travel Provision to 2017 hinders ARB's ability to remove it during Phase IV if the Board finds that nationwide commercialization of pure ZEVs is feasible.

Because of the need to support future growth of pure-ZEV technologies, suppliers, and infrastructure, plus the advantage of future flexibility in the regulations, we propose limiting the extension of the Travel Provision to 2014.

### ***4. Raise Bar for Type IV ZEV and Ensure No Backsliding***

ARB Staff has proposed to create a new Type IV ZEV category for vehicles with 200 miles range and fast refueling capability which earns 5 credits. ARB Staff states that a vehicle in this category "...would likely be an advanced fuel cell vehicle". However, all six large volume manufacturers and Daimler AG produce fuel cell vehicles which exceed the 200 mile range requirement. Thus, the Type IV ZEV is not a more advanced fuel cell vehicle and does not encourage technology development. Furthermore, the addition of the Type IV ZEV results in

backsliding of the pure ZEV requirement in Phase II from 2,500 to 2,000. This is counter to the Board Resolution 07-18 which stated, “The volume requirements for the first two phases of fuel cell development are appropriate...”

**Table 1:** Range of Current Fuel Cell Vehicles as quoted on manufacturer website.

Manufacturer and Fuel Cell Vehicle	Range (miles)
GM Equinox <sup>1</sup>	200
Ford Edge with Edge with HySeries Drive <sup>tm</sup>	225
Chrysler EcoVoyager	300
Daimler B-Class F-Cell	250
Toyota FCHV	>300
Honda FCX Clarity	270
Nissan X-Trail FCV <sup>1</sup>	234

We support rewarding manufacturers that advance technology, but the goals for additional credits should be set above currently available technology. We propose that the ARB Staff adjust the credit system so there is no decrease in the pure ZEV requirement in Phase II and also consider the following requirements to Type IV ZEV:

1. 300 mile range with no measurable decrease in other performance metrics (e.g., luggage and passenger volume)
2. Fast refueling capability
3. Federal Motor Vehicle Safety Standard certified
4. Achieves a minimum number of FreedomCAR and Fuel Technical Partnership Technical Goals
5. Available to the public for sale or a minimum three year lease

### **5. Oppose Extension of Type C AT-PZEV**

Type C AT-PZEVs are often called mild hybrids because they use low voltage, low power integrated starter generators (ISG) with small battery packs at a low cost. Many of them are simply belt-driven alternators and none of them provide the high voltage components which are crucial for the widespread introduction of pure ZEVs. The Type C HEVs in the marketplace use high-power NiMH batteries already in mass production and have smaller battery packs than Type D or E HEVs. For example, the previously available Saturn Vue Type C HEV had a battery pack size of 0.7 kWh at 36V<sup>2</sup>, but the new two-mode version (Type E HEV) has three times the energy (1.8 kWh at 300 V).<sup>3</sup> Thus, a Type C HEV uses off-the-shelf technology which does not contribute significantly to ZEV technology development.

We can examine the potential that auto makers will use the Type C HEVs as a loophole by comparing the cost-to-credit ratio of Type C, D, and E HEV. The ARB Staff Report for the

<sup>2</sup> HEVAmerica. 2007. *United States Department of Energy Advanced Vehicle Testing Activity 2007 Saturn Vue Hybrid Electric Vehicle.*

<sup>3</sup> General Motors North American International Auto Show Press Release. 2008. 2009 Saturn Vue Green Line 2 Mode Hybrid Will Be The World’s Most Fuel-Efficient V-6 SUV. January 6. Available online at <http://media.gm.com/us/gm/en/news/events/autoshow/08naias/brands/saturn/>

Greenhouse Gas Regulations estimates the retail price of a 42-Volt, 10 kW ISG at \$1107.<sup>4</sup> A Honda Civic Hybrid costs 4.3 times more than a conventional gasoline model with an ISG, but would only receive twice the credit. A Type E HEV, such as a Ford Escape, receives 2.5 times the credit of a Type C ISG HEV but costs 4.7 times more than a conventional gasoline model with an ISG. **Error! Reference source not found.** shows that the auto manufacturers have a financial incentive to use the Type C HEV as a loophole to fulfill their AT-PZEV credit requirement because they can receive more credits at a lower cost than by building more advanced Type D or C HEVs.

**Table 2:** Credit vs. Cost Differential of Type C, D, and E HEV

	ARB Proposed Phase II/III Credit	Credit Increase over Type C HEV	Cost Differential Over Gasoline Version	% Cost Increase over Type C HEV
Type C HEV	0.2		\$1107	
Type D HEV Honda Civic HEV	0.4	x2	\$4800	x4.3
Type E HEV Ford Escape HEV	0.5	x2.5	\$5200	x4.7

Given the fact that Type C HEVs do not contribute to technology advancement and the auto companies have a financial incentive to use the technology as a loophole to meet their AT-PZEV requirement, we recommend not extending the credits for Type C HEV—especially with no sunset—unless they use lithium batteries or other advanced energy storage systems not in commercial production.

## **6. Place Cap on Type I and I.5 ZEV and Limit Travel to 2011**

ARB Staff has introduced a new Type I.5 ZEV and removed the cap on Type I and I.5 ZEV (City EVs). This means that an automaker can meet its entire pure ZEV floor requirement with City EVs. ARB Staff claims that these vehicles are optimal, cost effective, and marketable BEVs, however, they provide no technical justification that a vehicle limited to 100 miles has the potential for mass market acceptance. Furthermore, BEVs with less than 100 miles were introduced in the 1990s (Ford Ranger EV, Chevy S-10 EV, etc.) using lead-acid batteries; without advanced batteries, these vehicles fail to advance electric-drive technologies.

ARB also notes in its Staff Report that the cost of a City EV is less than half the cost of a full-function BEV, but a Type I.5 ZEV receives almost the same credit value (2.5 versus 3). Several years ago the auto companies took advantage of a similar high credit-to-cost ratio and produced numerous NEVs to fulfill their pure ZEV requirement without any benefit to the ZEV Program and the State.

We see the advantages of early introduction of City EVs into the marketplace, but CARB must also consider the fact that City EVs can be used as a low cost loophole to fulfill the pure ZEV floor requirement with limited long-term benefits to the program. We therefore propose keeping the 50% cap on Type I and I.5 ZEV and limiting their Travel Provision to 2011, if they do not use advanced batteries.

<sup>4</sup> California Air Resources Board (ARB). 2003a. *Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles.* Sacramento, CA. August.

## 7. Quantitatively Define the Term “Advanced Batteries”

The ZEV Regulations use the term Advanced Batteries to define a Type C AT-PZEV. Unfortunately, Advanced Battery is a term that is both vague and changing, depending on the development of the technology. For example, high power nickel metal-hydrate batteries are being mass produced for use in hybrid vehicles on the road today and do not represent the advanced batteries needed for the pure ZEV and Enhanced AT-PZEV requirements of the ISOR. At this point, advanced batteries should more appropriately refer to the deep cycle nickel metal-hydrate and lithium batteries not currently in widespread use.

We ask that the ARB Staff define this term using a quantitative metric that acknowledges their commercialization status in vehicles.

## 8. Limit Neighborhood Electric Vehicles to AT-PZEV and PZEV Categories

Neighborhood Electric Vehicles (NEVs) are one classic example of a ZEV program loophole. In the early 2000’s auto manufacturers placed low cost, low technology NEVs in California for a short period of time only to fulfill their pure ZEV credit requirement. The NEVs were then abandoned or removed with almost no benefit to air quality and technology advancement. Because of this, automakers have banked over 123,000 pure ZEV credits from NEVs.

Use of banked NEV credits earned before 2008 for Enhanced AT-PZEVs could also undermine CARB’s goal to incentivize the production of plug-in hybrids. If automakers fulfill their pure ZEV floor, AT-PZEV, and PZEV requirements, the current amount of banked NEV credits could displace *all Enhanced AT-PZEV requirements in Phase II and close to two-thirds of the requirement in Phase IV*. Table 3, using data provided by CARB staff, shows the volume of vehicles produced when banked NEV credits are used to displace Enhanced AT-PZEVs.

**Table 3:** Use of Banked NEV Credits to Displace Enhanced AT-PZEV Requirements

Vehicle Type	2009-2011	2012-2014	2015-2017
ZEVs			
Fuel Cell Vehicle Type IV or	250	2,500	25,000
Fuel Cell Vehicle Type III or	200	3,125	31,250
Battery Vehicle Type II or	0	4,167	41,667
City EV Type I.5 or	0	5,000	50,000
City EV Type I	0	6,250	62,500
<b>Enhanced AT PZEVs</b>	<b>0</b>	<b>0</b>	<b>27,000</b>
AT PZEV	207,000	195,000	153,000
PZEV	1,260,000	1,260,000	1,260,000

Assumes Enhanced AT PZEVs earn 1.5 credits, AT-PZEV vehicles earn 0.65 credits in 2012 – 2014, and 0.55 credits 2015 – 2017. Based on annual California vehicle sales of 1.4 million passenger cars, light-duty trucks (LDT 1 and LDT 2) by the six large volume auto manufacturers.

The ARB Staff Concept Paper<sup>5</sup> proposed limiting the use of new NEV credits to pure ZEV backfill (Enhanced AT-PZEV), but not the pure ZEV floor. We agree with this limit because of the significant decrease in the number of pure ZEVs, and because, as the Staff noted, NEVs offer limited benefits to the program.

Because NEV's have been used as a pure ZEV credit loophole, we recommend limiting the use of the existing banked credits earned before 2008 to the (non-Enhanced) AT-PZEV or PZEV categories after 2011. NEV credits earned after 2008 may be applied to all categories outside of pure ZEV floor.

## **9. Modify Full Extension of Intermediate Volume Manufacturer Timeline**

The ARB Staff proposes extending, by six years, the time an Intermediate Volume Manufacturer (IVM) has to fully comply with ZEV requirements, exempting the IVM from producing any pure ZEV or Enhanced AT-PZEV technologies during this time. This means that an IVM does not have to produce any FCVs or BEVs, and must produce only a fraction of their AT-PZEV requirement, for twelve years after exceeding the Large Volume Manufacturer (LVM) threshold. Furthermore, because an IVM constitutes only 4-5% of the California fleet, their pure ZEV requirement is small. An auto manufacturer typically takes three years to bring a vehicle to market. Although a FCV or BEV would take longer, twelve years is an excessive extension of time to give a manufacturer to develop ZEV technologies.

Because of the importance of advancing pure ZEV technologies, supplier base, and infrastructure among all large manufacturers, we oppose the six year extension of timeline for transition from IVM to LVM with no pure ZEVs or Enhanced AT-PZEVs.

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<sup>5</sup> California Air Resources Board (ARB). 2007. *Concept Paper: Summary of Staff's Proposed Amendments to the Zero Emission Vehicle (Zev) Program*. Sacramento, CA. November.