



Public Policy Center

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Clerk of the Board  
Air Resources Board  
1001 I Street  
Sacramento, California 95814

General Motors provides the following comments on the Air Resources Board's proposed amendments to the California ZEV regulations being considered at the March 27, 2008 Board meeting. In addition to these comments, we also support the comments submitted via a letter dated March 14, 2008 by the large volume manufacturers (LVM letter), of which GM is a member.

Relative to the changes proposed by the ARB Staff, GM recommends the following additional changes:

- Changes to Accommodate and Encourage Extended Range Electric Vehicles
  - Create a separate category within Enhanced AT PZEV – either a new Type G or modify the proposed Type F – by requiring that the vehicle be able to run the high-speed/high-load US06 cycle in all-electric mode in order to qualify.
  - Increase the base credit level of this new category.
  - Gradually phase-down the 3X multiplier that applies through model year 2011 over the time period 2012-2014, for example, using a linear phase-down schedule.
- As detailed in the LVM letter, the ZEV volumes remain a concern in light of the lack of refueling infrastructure, cost and the technology assessment of the Independent Expert Review Panel. To address this, GM recommends increasing credit levels for ZEVs in 2009 and later model years. For example, the 10X drop in credit levels for fuel cell ZEVs is inconsistent with the findings of the Independent Expert Review Panel. In addition, the extension of the travel provision proposed by Staff is essential given the lack of infrastructure.
- As detailed in the LVM letter, do not change ZEV credit carry-forward provisions and how banked ZEV credits can be used.
- As detailed in the LVM letter, do not extend the transition period for intermediate volume manufacturers that become large volume manufacturers.

The following provides additional detail on the changes we recommend and the rationale for the changes.

#### Extended Range Electric Vehicles

The ARB has proposed changes to its regulations to accommodate blended plug-in hybrid electric vehicles (PHEVs) and urban-capable PHEVs. For blended PHEVs, the vehicles may be powered solely by the electric drive at low speeds, but the internal combustion engine will help to power the vehicle under most driving conditions. For urban-capable PHEVs (Type F), the vehicle is required to be powered solely by the electric drive during the urban dynamometer driving schedule (UDDS), but the IC engine may help to power the vehicle at speeds and accelerations that exceed the UDDS.

Since speeds and acceleration exceeding the UDDS are encountered on most driving trips, the PHEVs required under the proposed regulations will have very few driving trips with zero tailpipe emissions. Instead, most driving trips will result in IC engine operation and the associated tailpipe emissions.



including cold start emissions. And the PHEV technology will likely be conversions from conventional hybrids.

GM is developing an extended range electric vehicle (EREV) as demonstrated by the Chevy Volt first shown at the January 2007 North American International Auto Show. The EREV is different than blended and urban-capable PHEVs in that it is powered solely by electric drive under all driving conditions, including the higher speeds and harder accelerations encountered on most driving trips. The IC engine only turns on when there is no longer energy available in the battery, i.e., the battery has reached its minimum state of charge which is then maintained by the IC engine. In other words, the IC engine simply serves as a range extender.

Under the proposed regulations, the EREV would be classified as a Type F urban capable PHEV. This classification falls short, both in terms of the environmental benefits that the EREV provides and the ZEV technologies that the EREV requires.

In terms of environmental benefit, an EREV has zero tailpipe emissions until the battery reaches its minimum state of charge. For a vehicle such as the Volt that travels about 40 miles on battery energy alone after a recharge, this means that the majority of trips have zero tailpipe emissions. A driver that recharges each night and lives less than 20 miles from work (40 miles round trip) may have zero tailpipe emissions for many days in a row, or even weeks. And the zero emissions operation will become even greater for drivers that recharge at work as well as at home. In contrast, an urban-capable PHEV will have IC engine operation on most driving trips, and multiple cold starts on most days.

Regarding technologies, an EREV will use many of the same technologies required on a battery electric ZEV. The batteries and electric motors must be powerful enough to propel the vehicle under all driving conditions, including high speeds and hard accelerations. The battery, motor, and power electronics must be sized for the full capability of the vehicle. And the vehicle architecture must allow packaging of the large battery. In contrast, PHEVs that are conversions off of conventional hybrids will use many of the same technologies that the conventional hybrid uses.

To encourage manufacturers to develop EREV technology, GM recommends several changes to the regulations. First, a separate category within Enhanced AT PZEV (aka Silver+) needs to be established. This could be done by either adding a new Type G category or modifying the proposed Type F category. Either way, the criteria to qualify for this EREV category should be that the vehicle is able to run the high-speed/high-load US06 cycle in all-electric mode. Running the US06 cycle in all-electric mode will ensure that the vehicle's electric drive system is powerful enough to meet all driving conditions, including the speeds and accelerations encountered by California drivers. Second, the base credit level for the EREV category, i.e., the credit level before application of any multipliers, should be higher for the EREV category than for blended or urban capable PHEVs. And third, the 3X multiplier that applies through model year 2011 should be gradually phased-down for the EREV category over the time period 2012-2014, for example, using a linear phase-down schedule.

#### Fuel Cell Electric Vehicles

General Motors continues to make great progress on the development of fuel cell electric vehicles. GM has spent considerable financial and technical resources to date on fuel cell system R&D and we continue to commit resources to further improve these systems. We are currently in the process of deploying a fleet of over 100 Chevy Equinox Fuel Cell vehicles as part of Project Driveway to gain valuable



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customer feedback. This feedback will be used as we develop subsequent generations of fuel cell vehicles and continue to bring the cost down and improve the performance and durability.

The biggest challenge we see is aligning vehicle volumes and placements with infrastructure availability. Governments and the energy industry need to be as committed to developing a hydrogen infrastructure as we are to developing the vehicle technology, and we have not seen that commitment thus far. There is only one publicly accessible 700-bar station in the US – at UC Irvine. To support project Driveway, GM has needed to install its own hydrogen fuelers. Auto manufacturers need the necessary investment by energy companies to make sure an adequate hydrogen refueling infrastructure will be in place to support the vehicle placements. Our customers must have convenient access to access to affordable hydrogen. As we and other auto manufacturers continue to invest in fuel cell vehicle technology, there needs to be comparable investment by energy companies in hydrogen refueling technology.

Given the concern over infrastructure, the Staff's proposed changes to the travel provision are essential. In addition, the ZEV percentage requirements proposed by the Staff remain a concern in light of the lack of infrastructure, projected costs for fuel cell vehicles and the Independent Expert Review Panel's assessment of the technology. This should be addressed by increasing the ZEV credit levels in 2009 and later, as the ten-fold reduction in credit levels is not justified based on the technology assessment.

#### ZEV Credit Carry-Forward

The ARB proposes to restrict ZEV credits earned prior to the 2009 model year from being used toward gold requirements starting in the 2012 model year, and limiting ZEV credits earned in the 2009 and subsequent model years to a two-year carry-forward for use toward gold requirements. Manufacturers invested large amounts of money in early ZEV technologies for the purpose of generating credits. These investment decisions were based on generating ZEV credits that could be used toward future ZEV compliance based on the current ZEV regulations, without the restrictions that the ARB Staff has proposed. The ARB should not retroactively change how these credits can be used. In addition, the changes proposed will deter manufacturers from placing more ZEVs in service sooner than required to generate a compliance margin for protecting against unforeseen changes in product plans and market conditions.

#### Transition Period for Intermediate Volume Manufacturers

The proposed regulations would provide intermediate volume manufacturers six additional years (twelve years total) to transition into meeting large volume manufacturer requirements. This would place large volume manufacturers such as GM at a competitive disadvantage. All companies that change from intermediate to large will do so because of increasing sales, and many of the companies are large global companies with vast financial and technical resources. The current regulations that provide 6-years lead-time after exceeding the IVM threshold based on a 3-year sales average is an adequate transition period.

GM appreciates the opportunity to comment on the proposed changes to the ZEV regulations and will continue to work with the ARB in the future on this technology-forcing regulation.

Sincerely,



James S. Ehlmann