

# BMW Group

August 14, 2008

Mr. James Goldstene  
Executive Officer  
California Air Resources Board  
1001 I Street  
Sacramento, California 95814

## **Re: BMW Comments on the Proposed 15-Day Modifications to the Proposed Regulation Order for the California Zero Emission Vehicle (ZEV) Regulations**

Dear Mr. Goldstene:

BMW has participated extensively in the ongoing ZEV review process and is pleased to offer the following comments in response to the California Air Resources Board 15-day Notice that was released on July 25, 2008.

### **BMW Contributions to Clean Air and Advanced Technology**

BMW is currently classified as an Intermediate Volume Manufacturer (IVM) and has made significant investments over the years to advance clean engine technologies, taking a leadership role in introducing PZEV technology in six-cylinder engines. Most significantly, for more than 25 years BMW has focused and continuously invested in the development of hydrogen internal combustion engine (ICE) propulsion and storage systems. BMW's achievements in this area are well documented, including its manufacturing of one hundred hydrogen powered vehicles. Twenty-five of these vehicles are being operated in the state of California, for which BMW has also invested into the hydrogen infrastructure. BMW will continue its efforts to optimize emission performance and to improve hydrogen storage and the efficiency of its hydrogen ICE propulsion system in order to demonstrate the future potential that these technologies have to contribute to a sustainable clean mobility future.

Since with the proposed changes the pure gold requirement can not be fully satisfied by hydrogen ICE systems, BMW will introduce its first limited Battery Electric Vehicle (BEV) series production in MY 2008. Several next steps in the development and introduction of BEV technology are planned in the coming years.

### **Carry Forward of Early Generated ZEV Credits**

The 15-day Notice includes a provision for early generated ZEV Credits (MY 2008) from IVMs which can be carried forward for the first three years after the manufacturer becomes subject to the Large Volume Manufacturer (LVM) requirements.

This change is of great importance for our MY 2008 BEV program; therefore, BMW completely supports this proposal. It encourages manufacturers that are not

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subject to the pure gold requirements today to introduce zero emissions technology into the market. This change supports the CARB target to avoid long ZEV production black-out periods.

BMW also believes this provision provides strong motivation for manufacturers to introduce BEVs as early as possible and to base future developments on a stable regulatory path.

### **Extended Travel Provision**

For BMW, the extension of the travel provision, with the inclusion of BEVs and the inclusion of a formula scaling ZEV credits by the ratio of total LVM sales in the state receiving credit to total LVM sales in California, provides a significant incentive for the placement of ZEVs in section 177 states as well as in California. Because of the limited timeframe in which the extended travel provision can be applied (Type II BEV until MY 2014), an incentive for the early introduction of ZEVs is provided.

The motivation that is provided by these aspects of the extended travel provision is demonstrated by the current BMW BEV program, in which BEVs will be placed in California, New York and in New Jersey. BMW completely supports the extension of the travel provision.

### **BMW Proposal:**

BMW proposes that, in addition to the provision starting with MY 2009, the extended travel provision should be applied to ZEV Credits (Type I – Type V) generated from IVMs before they are subject to the LVM requirements. For BMW, this would mean that the travel provision would be applied to the MY 2008 BEV credits.

This proposal would be in line with the carry forward provision for early generated ZEV Credits of IVMs. We believe that this proposal would provide the flexibility suggested by the Board while assuring that companies like BMW will continue to provide the greatest air quality benefit to the state of California and at the same time contribute significantly to the advancement of low emission technology and the electrification of their vehicles as advocated under the ZEV mandate.

### **Hydrogen Storage System**

According to the 15-day Notice, a hydrogen storage system would receive a PZEV Allowance of 0.3 in case of a high pressure system capable of refuelling at 5000 psi or in case of hydrogen stored in a nongaseous form. This paragraph and even the recent change do not reflect innovative tank systems such as cryo-compressed hydrogen storage systems. BMW therefore proposes to modify the regulatory wording to account for innovative hydrogen storage systems based on their storage capacity. Future targets for hydrogen storage capacity are defined by the U.S. Department of Energy (DOE): see [http://www1.eere.energy.gov/hydrogenandfuelcells/storage/pdfs/targets\\_onboard\\_hydro\\_storage.pdf](http://www1.eere.energy.gov/hydrogenandfuelcells/storage/pdfs/targets_onboard_hydro_storage.pdf)

DOE targets a storage system capacity of 1.5 kWh/L and 2.0 kWh/kg for 2010. BMW's new approach to cryo-compressed hydrogen storage promises a major step forward to reach combined DOE 2010 and 2015 storage targets, including system capacity and thus, system energy density.

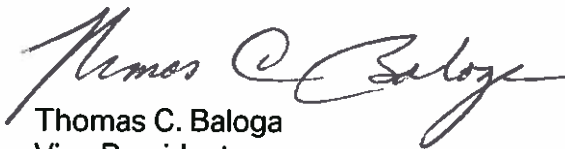
Insulated cryo-compressed hydrogen storage can be charged with compressed liquid hydrogen as well as with chilled gaseous hydrogen at a pressure below 5000 psi and at cryogenic temperatures between 80K and 100K. Such storage of chilled gaseous hydrogen can lead to more than a double physical density and more than a double volumetric capacity than gaseous 5000 psi hydrogen storage at ambient temperature. Thus, an advanced cryo-compressed hydrogen storage system allows high energy densities in gas storage even below 5000 psi storage pressure. BMW therefore proposes to define innovative storage systems based on the DOE storage target definition of system capacity rather than on a fixed storage pressure, and to add a formula to account for systems that provide an additional storage capability.

BMW Proposal to Modify the Regulatory Wording on Storage Systems:

(a) *Use of High Pressure Gaseous Fuel or innovative Hydrogen Storage System.* A vehicle equipped with a high pressure gaseous fuel storage system capable of refueling at 3600 pounds per square inch or more and operating exclusively on this gaseous fuel shall qualify for an advanced componentry PZEV allowance of 0.2. A vehicle capable of operating exclusively on hydrogen stored in a high pressure system capable of refueling at 5000 pounds per square inch or more, or stored in nongaseous form or at cryogenic temperatures, shall instead qualify for an advanced componentry PZEV allowance of 0.3. Advanced hydrogen storage systems enabling a specific storage capacity higher than that of high pressure systems capable of refueling at 5000 pounds per square inch shall receive the PZEV allowance of 0.3 multiplied by the ratio of the specific storage capacity (kWh/L) of advanced systems to the specific storage capacity of high pressure systems capable of refueling at 5000 pounds per square inch.

If you have any questions regarding our comments or need additional information, please contact Wilhelm Hall at 201-571-5177.

Sincerely,



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Engineering-US

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