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**Ford Motor Company Comments on
Notice of Public Meeting to Consider
A Status Report on the Zero Emission Vehicle (ZEV) Program
April 23, 2007**

Ford Motor Company (Ford) welcomes the opportunity to comment on California's Status Report on the Zero Emission Vehicle (ZEV) Program. The Zero Emission Vehicle Program is a "technology-forcing" regulation that has needed to be modified on several occasions because the pace of technological development, costs, and realities of the marketplace have not met the expectations set by the Air Resources Board (ARB). As expressed in prior comments, Ford continues to believe that the ZEV mandate is an ill-advised regulation because it imposes high costs on manufacturers for minimal air quality benefits, it does not align with market demand, and it distracts manufacturers from the pursuit of future technologies by imposing artificial near-term obligations. Setting aside those objections for purposes of these comments, we are generally in agreement with the conclusions with staff's Status Report on the California Air Resources Board's Zero Emission Vehicle Program. Specifically, Ford's comments on fuel cell vehicles, battery electric vehicles, plug-in hybrid electric vehicles, advanced technology PZEV volumes, and hydrogen internal combustion vehicles are provided below. Our comments also address the additional issues raised, including intermediate volume manufacturers and Section 177 state "travel provisions".

Fuel Cell Vehicles

In the 2003 ZEV Rulemaking, the ARB created the optional alternative path to encourage the development and production of fuel cell vehicles. However, there was great uncertainty in the pace of technological developments with this emerging technology. Great progress has been made in addressing many of the technological challenges of fuel cell propulsion systems; however, many technical and commercial challenges still exist, which prevents large scale introduction of this technology. Technical challenges include fuel cell stack and system durability and robustness, on-board fuel packaging, and weight. Commercial challenges include cost and availability of hydrogen infrastructure. The high volume requirements mandated by the ZEV regulations detract from Ford's ability to overcome these remaining challenges through core fuel cell research and development because resources must be deployed to building high volumes of immature technology vehicles. For these reasons, Ford supports the Staff's recommendation that the Board adjust the Alternative Path phases to allow further demonstrations on the order of hundreds or low thousands of vehicles.

Not only should the regulated fuel cell volumes be addressed, but the credit levels should also be adjusted. The credit for a fuel cell vehicle drops from 40 in 2003 – 2008 model years to 4 in 2009 – 2011 model years. This order-of-magnitude credit drop is not justified by the technical or commercial readiness of fuel cell vehicles. Ford recommends that the Board direct Staff to evaluate the credit structure in addition to the volume requirements for fuel cell vehicles.

Battery Electric Vehicles (BEVs)

Ford has been involved in battery electric vehicle research and development since the 1960s; way before the ARB's ZEV regulations. Ford has spent nearly a billion dollars on battery electric vehicle development (not including core research) and Ford continues to work on advanced battery research. Despite these efforts, battery electric vehicles have not been able to break into the market, beyond niche applications. Technical challenges are principally related to the battery, including deep discharge cycle life, robustness, and gravimetric and volumetric energy density. Commercial challenges include high cost, limited driving range, long recharge times, and limited infrastructure.

The 2003 ZEV regulatory revisions concentrated on fuel cell vehicles under the optional alternative path. However, because of the challenges of battery electric vehicles, it is not feasible

to meet the ZEV regulations with battery electric vehicles. Ford supports the Staff's recommendation to examine more even treatment of BEVs in the regulation as compared to fuel cells. This should include an evaluation of adjustments to the base path provisions of the regulations, in addition to adjustments under the alternative path provisions of the regulations. Ford believes that there is a role for battery electric vehicles; however, the ZEV regulations must be carefully crafted so that the market is not flooded with more vehicles than customers, considering the limited driving range and long recharge time. Ford recommends that the examination of more equal treatment of BEVs include removing the cap on the use of BEVs under the alternative path, eliminating the 10 to 1 substitution ratio under the alternative path, and adjusting the BEV credit level.

Plug-in Hybrid Electric Vehicles (PHEVs)

There is a lot of interest in plug-in hybrid vehicles. However, similar to battery electric vehicles, the principal challenges are related to the high energy / high power batteries needed for plug-in hybrid vehicles. PHEV batteries must be further developed for durability and robustness, including the ability to withstand a large number of deep discharge cycles over the life of the vehicle, cold temperature charge acceptance, and ability to operate in a large range of operating temperatures. It is important that plug-in hybrid batteries have a 10 year / 150,000 mile life, and are not thrown out after three years, like cell phone or laptop computer batteries. Plug-in Hybrid vehicle challenges include control of cold start emissions under load, ability to meet evaporative emissions with less engine operation, and cost.

Because PHEVs are not zero emitting, Ford supports Staff's recommendation against allowing PHEVs to be used in the true-ZEV category. However, due to the technical and cost challenges of PHEVs, Ford believes that the AT-PZEV credit structure should be used to encourage the development and production of PHEVs. For example, the 2003 ZEV regulatory revisions included early introduction multipliers for PHEVs. However, unless a manufacturer already planned to have a PHEV program, the early introduction multipliers phase-out before manufacturers were able to approve, design, and produce a PHEV program. Ford recommends that the early introduction multipliers be extended to encourage early introduction of PHEVs.

Also, Ford recommends that the same PHEV credit be provided to a "blended operation" PHEV. A "blended operation" PHEV will use energy from the grid to compliment the operation

of the vehicle's internal combustion engine, but may not provide significant all electric range. The same goals are achieved with a "blended operation" PHEV as with an "all electric range" PHEV; i.e., advancing technology, reducing emissions, diversifying energy usage, and lowering greenhouse gas emissions. Ford looks forward to working with Staff to develop a credit proposal and test procedures to address "blended operation" PHEVs.

Advanced Technology Partial Zero Emission Vehicles (AT-PZEVs)

Although a variety of technologies (e.g. compressed natural gas, hydrogen internal combustion) qualify as AT-PZEVs, hybrid electric is the only technology that is expected to achieve the high volumes required by the ZEV regulations. Ford is one of the first manufacturers to come out with a full hybrid electric vehicle, the Escape Hybrid in 2005MY. In 2007, the Mariner Hybrid was added. In 2009, we plan on adding hybrid versions of the Fusion and Milan. Ford is committed to the advancement of hybrid technology as demonstrated by these product introductions. However, cost is still a significant challenge for hybrid technologies. The increased volumes required by the ZEV regulations are exacerbated not only by the percentage requirement increase, but the phase-in of light duty trucks >3750 lbs. gross vehicle weight (LDT2), and the decreasing credit value. The increased volume requirements are not supported by corresponding cost reductions, making the AT-PZEV requirement unsustainable. Furthermore, the existence of the AT-PZEV category is justified by CARB on the grounds that such vehicles provide incremental technological advances to support the development of true-ZEVs. However, the volume requirements for AT-PZEVs are inconsistent with this asserted justification. No appreciable technological or production advances achieved would be expected by increasing the requirement beyond what is required for mass commercialization (~100,000 units per year, nationwide).

Ford recognizes ARB's desire to continue to increase the percentage of AT-PZEVs required; however, we do not feel that the decrease in credit level is justified. Ford recommends that the Board direct the staff to evaluate the AT-PZEV credit structure in consideration of the ongoing cost challenges associated with HEV technology.

Hydrogen Internal Combustion Vehicles (H2ICVs)

Ford is one of two manufacturers that are producing hydrogen internal combustion vehicles. We currently have a 12-passenger E-450 shuttle bus demonstration program that is accumulating customer mileage in four different cities. Hydrogen internal combustion vehicles provide a transition from today's fossil fuel dominated powertrains to a pathway that is powered by renewable fuels which have the potential to be environmentally benign. Ford disagrees with the Expert Panel's conclusion that hydrogen internal combustion vehicles do not advance zero emission technology, because, as acknowledged by the Panel, one of the key challenges to fuel cell vehicles is hydrogen storage, which is the same challenge for hydrogen internal combustion vehicles. In addition to the principal technical challenge related to hydrogen storage, commercial challenges with H2ICVs include hydrogen infrastructure and costs. H2ICVs have the potential to encourage faster deployment of hydrogen infrastructure in support of California's hydrogen highway.

Because H2ICVs are not zero emitting, Ford supports Staff's recommendation against allowing H2ICVs to be used in the true-ZEV category. However, due to the technical and cost challenges of H2ICVs, Ford believes that the AT-PZEV credit structure should be used to encourage the development and production of these vehicles. For example, Ford recommends that the early introduction multipliers be extended to encourage early introduction of H2ICVs, which will advance hydrogen storage technology and develop the hydrogen infrastructure.

Intermediate Volume Manufacturers

ARB staff intends to examine the implications of adjusting the intermediate volume manufacturer definition. The ZEV regulations put large volume manufacturers at a competitive disadvantage compared to intermediate volume manufacturers that are profitable and growing. Furthermore, many intermediate volume manufacturers have large global resources and are already developing fuel cell technologies. Because of the competitive issues, Ford does not support changes to the intermediate volume manufacturer definition; however, if changes are made, it is important that the changes do not impact the large volume manufacturer's obligations.

Section 177 State "Travel Provisions"

There are now 11 states that have adopted California emissions standards, 9 of which include the zero emission vehicle program. Therefore, it is important that the ARB considers these other states in developing their regulations. Clarifying changes are needed to the existing regulation that clearly state that the fuel cell vehicle obligation in S177 states is proportional to California's obligation based on the ratio of sales volume in the state compared to California. Also, the "travel provision" sunsets in 2011MY; however, the state of fuel cell technology and infrastructure development does not support a sunset date this early. Ford recommends that the "travel provision" be extended. Finally, as staff evaluates more even treatment of battery electric vehicles, the impact of other states on the deployment of BEV technology should be included in this evaluation; especially, considering the state of infrastructure development in various states and the high cost of these vehicles.

Conclusion

Ford supports ARB's goal for a sustainable zero emission vehicle transportation system. However, pushing specific technologies into the market before they are commercially viable could lead to market rejection which could further delay achievement of ARB's goals. Therefore, Ford supports the Staff's recommendation to revise the ZEV regulations in light of the state of technology.