Alec Brooks
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Comments to CARB on the ZEV Staff Report

Alec N. Brooks
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Thank you for the opportunity to comment on the zero emissions vehicle program. I am here today representing myself; the views expressed are my own.

There is one question that CARB didn't address in the staff report and didn't ask the expert panel to address. The question is: Are vehicles fueled by hydrogen a desirable long term goal in the first place? An executive order by the Governor may make it a state policy, but that doesn't necessarily make it a good idea.

I have been a vocal opponent of hydrogen-powered vehicles for almost five years. The reason I don't like hydrogen for vehicles is principally because of its poor energy efficiency and high greenhouse gas emissions compared to the alternatives. Hydrogen is principally made from natural gas or electricity, both of which work well directly to power vehicles. There needs to be a compelling reason to incur the energy losses in converting natural gas or electricity to hydrogen rather than just using these sources directly.

Making hydrogen from natural gas loses about a third of the energy in the natural gas in the process. For a given amount of natural gas, it is more efficient to put the natural gas directly into a natural gas hybrid vehicle than to convert it to hydrogen for a fuel cell vehicle. You get more miles of travel using the natural gas directly than converting to hydrogen.

Making hydrogen from electricity is so bad that it should be outlawed. Fuel cell vehicles powered by hydrogen made with electricity use four times as much electricity per mile as a battery electric vehicle. Many hydrogen proponents explain this away by saying that the hydrogen will be produced with renewable electricity – as if it didn't matter at all how <u>much</u> electricity it takes to make the hydrogen.

But renewable electricity used to make hydrogen is renewable electricity that is not fed to the grid to offset combustion-based generation. In comments I submitted to CARB in 2005, I showed how fuel cell vehicles

have by far the highest CO2 footprint compared with other vehicle alternatives when all of the alternatives are evaluated on a level playing field, with each alternative incorporating the same amount of renewable energy.

The staff report contains an amazing statement that demonstrates just how far off the track the ZEV program has strayed. In reference to battery electric vehicles the staff report notes:

> *However, because they cost much less than fuel cell vehicles (about 10th), BEVs may only be used to meet up to half of the Alternative Path obligation and they may substitute for a fuel cell vehicle at a rate of ten to one.*

So CARB is saying that one fuel cell vehicle is equally desirable as ten battery electric vehicles. In other words, vehicles with the highest cost and the highest energy consumption are what we want!

In closing, I encourage the board to revisit the question of whether California should actually want hydrogen-powered vehicles – even in the long term. The alternatives are far better and are available in the near term. Unless and until we have a zero carbon electricity grid, it makes no sense to make hydrogen with electricity. And it is better to use natural gas directly in vehicles than to convert it first to hydrogen.

Thank you.

Alec Brooks
alecbrooks@earthlink.net