Assessment of the EPA/NHTSA/CARB LDV report

The EPA, NHTSA and CARB issued a report[1] in September, 2010, evaluating alterative vehicles in the context of reducing GHGs via new CAFÉ standards. This 245-page report is packed full of details about advanced ICEs and alternative vehicles.

While the report at least includes hydrogen-powered fuel cell electric vehicles (FCEVs) in the analysis, it clearly follows the Obama Administration's emphasis of BEVs and PHEVs. For example:

1. Market penetration. The interim report shows no FCEV market penetration by 2025, while BEVs are assumed to reach 14% market penetration in Table ES-3, and up to 20% market penetration in Path D in Table 3.3-1. This, despite the estimate by the major OEMs that FCEVs will be cost competitive with BEVs and PHEVs by the 2020 to 2025 time period (pg 2.6), and the results of an OEM survey, showing that the OEMS are planning to deploy 839 FCEVs in California alone in 2014 and a total of 44,706 FCEVs in the 2015-2017 time period (pg 4-21) They do not take into account the likelihood of low BEV market penetration, given that current battery technology will limit BEVs primarily to small cars, trucks, vans and SUVs.
2. GHG labeling hoax: the report continues the EPA/NHTSA charade that BEVs produce zero GHG emissions by listing only tailpipe emissions in their new vehicle window stickers. (pg 5-10)
3. GHG projections: Our analysis shows that even if all small LDVs and 50% of all midsize sedans were replaced by BEVs, then GHGs would be reduced only 9.3% in 2015, while FCEVs would cut GHGs by 50% using hydrogen made from natural gas (which this report does acknowledge on pg B-33, unlike the Secretary of Energy!)
4. Fuel infrastructure cost: the report does tabulate the costs of installing electrical outlets, but does not connect the dots. For example, as shown in Table 1, the average cost of an electrical outlet per BEV[2] was $1.3 million/BEV, due mainly to the GM outlet cost of $7.6 million/EV; but even the weighted average cost per BEV was $91,626. These data were all taken from Table 4.2-1, page 4-4 of the interim report. Needless to say, they did not show the $/station or $/EV calculations! The report also lists the costs for hydrogen fueling infrastructure, as summarized in Table 2 (data taken from Table 4.32 on page 4-20 of the report). These data show that the cost of electrical infrastructure per BEV is between 5.6 (high H2 costs) and 6.0 (low H2 costs) times more than the cost of hydrogen infrastructure per FCEV. **Furthermore, if the government investment of $1.2 billion in electrical outlets had been spent on hydrogen infrastructure instead, then it could have funded between 286 and 505 hydrogen stations, enough to support between 61,000 and 78,300 FCEVs instead of only 13,000 BEVs.**
5. GHG reductions. Finally, Table 3 illustrates that investing $1.2 billion in hydrogen infrastructure instead of electrical infrastructure would allow 4.7 to 6 times more FCEVs than BEVs on the road

[1] "Interim Joint Technical Assessment Report: Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average fuel Economy Standards for Model Years 2017-2025, by the Office of Transportation and air Quality, US EPA, National Highway Traffic Safety Administration and the California Air Resources Board, September, 1020, available at: http://www.epa.gov/oms/climate/regulations/ldv-ghg-tar.pdf

[2] As I understand their Table 4.2-1, the listed costs are the Federal ARRA cost, not necessarily the total costs. So to the degree that the companies cost-shared some or all of these projects, the cost per BEV could be higher!

and those **FCEVs would displace 6 to 7.6 times more GHGs than the BEVs with the average US grid mix projected for 2035 to 2045**.[3]

Table 1 Recovery act costs for electrical outlets and calculations of the cost per station and the cost per EV supported.

	ARRA funds $million	# of LEVEL 2 stations	# of Level 3 stations	# of Evs	$/station	$/EV
ECOtality	115	14850	320	8500	$ 7,581	$ 13,529
Coulomb Technologies	15	5000		2600	$ 3,000	$ 5,769
Navistar	39	950		950	$ 41,053	$ 41,053
GM	950	650		125	$ 1,461,538	$ 7,600,000
Smith electric vehicles*	32	500		500	$ 64,000	$ 64,000
SCAQMD**	45	378		378	$ 119,048	$ 119,048
Totals	1196	22328	320	13053		
*supplying medium duty trucks				AVERAGE:	$ 282,703	$ 1,307,233
**supplying medium duty trucks & a shuttle				Weighted average:	$ 52,808	$ 91,626

Table 2 Estimated cost of hydrogen infrastructure per vehicle supported

VMT	15,000	miles
FCEV Fuel economy	68.3	miles/kg
Annual H2 Use/FCEV	219.6	kg/year
Average daily H2 Use	0.6017	kg/day

Hydrogen stations	CARB cost ($millions)		Capacity kg/day)		# of FCEVs supported		Cost per FCEV	
	Low	High	Low	High	Low	High	Low	High
Tube trailer delivery	1		100	100	166.2	166.2	$ 6,017	$ -
High pressure composite Delivery	1	1.7	100	100	166.2	166.2	$ 6,017	$ 10,229
Liquid hydrogen	1.7	2.7	100	200	166.2	332.4	$ 10,229	$ 8,123
Onsite electrolysis	2	4	60	130	99.7	216.1	$ 20,057	$ 18,514
Onsite SMR	2.5	4	100	140	166.2	232.7	$ 15,042	$ 17,191
Energy station/gasifier	6	8.5	100	100	166.2	166.2	$ 36,102	$ 51,144
Averages:	2.37	4.18	93.3	128.3	155.1	213.3	$ 15,577	$ 17,534
Weighted average:							$ 15,257	$ 16,332
Ratio of electrical infrastructure cost per vehicle to hydrogen infrastructure cost per vehicle:							6.01	5.61
# stations supported by $1.2 billion	505.4	286.1						
# FCEVs supported by $1.2 billion					78,389	61,026		

[3] Source of GHG data: "Well-to-wheels greenhouse gas emissions and petroleum use for mid-size light duty vehicles," by Tien Nguyen and Jake Ward, US DOE October 25, 2010, available at http://www.hydrogen.energy.gov/pdfs/10001_well_to_wheels_gge_petroleum_use.pdf

Table 3. Comparison of fueling infrastructure possible for $1.3 Trillion investment and resulting GHG reductions

VMT:	15,000	miles		Gasoline ICV*	BEV**	FCEV***	
Fuel infrastructure for $1.2 billion:				grams/mile	grams/mile	grams/mile	
	electrical	Hydrogen		340	230	200	200
		Low	High	Annual GHGs Savings(metric tonnes/year)			
Number of stations	22,328	505.4	286.1			High	Low
Number of vehicles	13,053	78,389	61,026		21,537.5	164,616.2	128,155.1
Vehicle ratios:		6.0	4.7	GHG Savings ratios:		7.6	6.0
				* GHG emissions for 2035 to 2045 time period for midsize sedan			
				**BEV emissions for average US grid mix			
				***FCEV emissions assuming all hydrogen made from natural gas			