

New 2010 DOE Hydrogen and Fuel Cells Program Plan¹

After Secretary Chu initially attempted to eliminate all funding for hydrogen and fuel cell electric vehicles (FCEVs) and--after Congress restored much of the funding--attempted to turn the program into a long-range R&D project without any emphasis on FCEVs, limiting applications to portable and stationary fuel cells and material handling equipment, he has apparently agreed to quietly add back FCEVs into the nation's mix of alternative light duty passenger vehicles. In particular, this new draft program plan includes these points:

- Storing renewable energy as hydrogen is a key area that could have tremendous impact on the growth of clean energy generation.
- Fuel cell lift trucks and other material handling equipment can save up to 50% in costs compared to battery lift trucks (from a Battelle report) and FC lift trucks will cut greenhouse gases (GHGs) by up to 33% more than battery lift trucks (with the average US utility grid mix)
- The plan acknowledges that six companies² have announced plans to commercialize FCEVs before 2015, after stating previously that the FCEV is a long-term, multi-decade development.
- The plan acknowledges that FCEVs (with hydrogen from natural gas) will produce less GHGs than other alternative vehicles being heavily promoted by the administration:
 - FCEVs will produce 40% lower GHGs than regular gasoline ICVs
 - FCEVs will produce 15% lower GHGs than gasoline HEVs
 - FCEVs will produce 25% lower GHGs than gasoline PHEVs
- The plan acknowledges the aggressive hydrogen infrastructure and FCEV plans in other countries including
 - Japan's plans to deploy 1,000 hydrogen fueling stations and 2 million FCEVs by 2025
 - Germany's plans to deploy 1,000 hydrogen fueling stations by 2017
- **JOB CREATION:** the plan references the impact of H₂ and FCEVs on jobs:
 - The DOE's own study projects 150,000 new manufacturing jobs by 2020
 - And 675,00 jobs in hydrogen and FCEVs by 2035
 - Interestingly, they quote a study by the American Solar Energy Study that projects that hydrogen and FCEVs in their "aggressive scenario" will generate revenues up to \$81 billion by 2030 with direct and indirect employment of 925,000 people³

¹ Available at http://www1.eere.energy.gov/hydrogenandfuelcells/mypp/program_plan.html

² Daimler, Toyota, Honda, GM, Hyundai and Proterra.

³ It is encouraging that the ASES includes hydrogen and fuel cells in their estimates of green technology impacts. In the base case, the ASES estimates \$9.3 billion revenues and 15,800 jobs for hydrogen and fuel cells, and in a moderate case, they estimate \$26.3 billion revenues and 301,000 jobs for hydrogen and fuel cells. See http://www.ases.org/index.php?option=com_content&view=article&id=465&Itemid=58

- The plan quotes data from the Connecticut Center for Advanced Technology that projects future global revenues from hydrogen and fuel cells of:
 - \$14 billion/year to \$31 billion/year for stationary power
 - \$11 billion/year for portable power, and
 - \$18 billion /year to \$97 billion/year for transportation.
- The plan still includes "technology validation" and "market transformation" tasks (however, see potentially negative impacts below).
- The technology validation plan still includes FCEVs with a goal of demonstrating 300 miles range and 5,000 hours durability. (See potentially negative comments below)
- The "Market transformation" task includes a desire to deploy FCEVs in Federal fleets.
- The plan states that hydrogen storage for electric utilities could provide a cost-competitive alternative to peak-power "shortly after 2012," again refuting the DOE's previous stand that hydrogen and FCEVs are a long-term, distant prospect.
- The plan reports that DOE has now officially reduced their delivered hydrogen cost goal from the previous \$2/gge to \$3/gge range up to a range from \$2/gge to \$4/gge to take into account the projected rising gasoline prices and the improved fuel economy of FCEV relative to the alternatives.
- The plan acknowledges that DOE receives advice and recommendations from the Hydrogen and Fuel Cell Technical Advisory Committee (HTAC), although they certainly did not follow the advice offered to the incoming administration in December, 2008:

"The HTAC urges national leaders to put a high priority on bringing hydrogen and fuel cells into full commercial use. This clean energy technology must be a critical part of the "New Energy Economy" that will become a legacy of our time."⁴

Potentially worrisome aspects of the 2010 plan:

- Hydrogen Storage. The plan continues to emphasize the lack of an adequate hydrogen storage technology, a long-standing DOE concern that predates the arrival of Dr. Chu. However, the plan no longer states that we need a "Breakthrough" in hydrogen storage to deploy commercial FCEVs, a previous stand that probably emboldened the Secretary to list hydrogen storage as the number one of his four "miracles"⁵, "required before FCEVs could become a

⁴ From "Talking points for the new administration," December 2008, available at http://www.hydrogen.energy.gov/pdfs/htac_talking_points.pdf

⁵ The other "miracles" listed by Dr. Chu were hydrogen infrastructure (this plan acknowledges that disturbed hydrogen from natural gas was achieved before Dr. Chu became Secretary), hydrogen from sources other than natural gas (SunHydro opened its first solar hydrogen fueling station in Wallingford, Ct on October 15, the first of several planned for a totally renewable hydrogen highway from Maine to Florida, installed without any DOE support by private industry.); the fourth required "miracle" according to Dr. Chu would be to develop reliable FCEVs by 2020. Given that

reality. This new plan still says that “advanced storage systems will be required.” Along with the statement that compressed hydrogen storage tanks “are heavier and take up more space than conventional fuel tanks.” This is the wrong metric, however. One should consider the total space for all equipment, not a component-by-component comparison with existing technology. The FCEV does not require a bulky transmission, a catalytic converter, etc. We have shown previously that the total on-board volume for the hydrogen tank, the fuel cell system and a peak power battery on a FCEV will be less than the space occupied by even an advanced Li-Ion battery pack on a BEV⁶. Is the DOE going to require a significant reduction in battery volume before pursuing BEVs?

- FCEV Range. The plan does not acknowledge that DOE Lab engineers have validated that the Toyota Highlander FCEV (which Toyota calls the FCHV-adv) has achieved a range of 431 miles under on-road conditions⁷. Instead, they quote a maximum FCEV range of 254 miles from the NREL learning demonstration program.
- Under hydrogen infrastructure, after stating that DOE will monitor and coordinate hydrogen infrastructure activities in the field, the plan includes this disturbing sentence: **“However, large-scale establishment of hydrogen infrastructure will involve a partnership with industry and other agencies such as DOT, and will occur beyond the scope of the R,D & D program.”** In other words, the DOE is refusing to use the hydrogen and FC program to continue the partial funding of hydrogen infrastructure, which will be essential to continue FCEV deployments. This is particularly disturbing compared to the \$4.2 billion that the Federal government has provided for battery development, given the limited potential for BEVs compared to FCEVs from a market penetration potential and hence an environmental impact.

Key Question: will the anti-hydrogen, anti-FCEV White House allow this draft plan to go forward without modification? Comments are welcomed by DOE until November 31, 2010, and the report will not be finalized until 2011.

six companies are planning to commercialize FCEVs before 2015 according to this plan, it would seem that this miracle has been or shortly will be achieved, too

⁶ See: http://www.cleancaroptions.com/html/ev_volume.html

⁷ See: http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/toyota_fchv-adv_range_verification.pdf