DOE Hydrogen and Fuel Cells Program Record	
Record #: 5035	**Date:** May 22, 2006
Title: Cost Analysis of Hydrogen Production from Natural Gas 2003 - 2005	
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Item:

Based on research progress, analysis indicates that the modeled cost of producing hydrogen from natural gas has been reduced by 40% from 2003 to 2005 --- $5.00/gge in 2003 to $3.10/gge in 2005.

Supporting Information:

The results of a 2003 economic analysis were used to estimate the cost of hydrogen produced from distributed natural gas reforming at $5 per gallon of gasoline equivalent (gge) (See the Hydrogen, Fuel Cells, and Infrastructure Program Multi-Year Research, Development and Demonstration Plan, page 3-10 at http://www1.eere.energy.gov/hydrogenandfuelcells/mypp/pdfs/production.pdf)

Since the original analysis, DOE-sponsored R&D has resulted in significant cost reductions, largely attributable to engineering improvements that include:

- Reduced cost of hydrogen purification technology
- Improved systems integration
- Integrated thermal management
- Improved catalyst performance

These improvements were used to conduct another analysis in 2005 using the H2A model, a model developed to provide consistent analysis methodology for a variety of hydrogen production pathways (http://www.hydrogen.energy.gov/h2a_analysis.html). The model was developed in conjunction with national laboratory and industry experts, and has been peer reviewed and beta tested using several hydrogen production and delivery pathways. The results of the 2005 analysis have shown a 40% reduction (to $3.10 per gge) in the cost of hydrogen produced from distributed natural gas reforming. The cost analysis and methodology are now being independently verified by a panel of experts to evaluate progress of research efforts in hydrogen production cost reduction. The next step will be to take the best available technology from the laboratory and build and validate a system.

The cost analysis assumes that a small-scale natural gas steam reformer is added to an existing fueling station, and the analysis includes the cost of hydrogen production, compression, storage, and dispensing to the vehicle. Energy Information Administration (EIA) prices for natural gas were used in the model: $4.40 per million British thermal units (MMBtu) in the 2003 analysis (based on the lower heating value), and $5.24 per MMBtu in the 2005 analysis. (The difference

between the EIA's 2003 and 2005 natural gas price is less than the rate of inflation, indicating that the 2005 hydrogen production cost analysis is a conservative estimate.)

The EIA typically underestimates energy prices. Therefore, the DOE Hydrogen Program conducts sensitivity analysis on hydrogen cost. For example, natural gas at $12.50 per MMBtu (the actual November 2005 cost) would yield a hydrogen cost of $4.50 per gge. Because of the higher efficiency of hydrogen fuel cell powered cars compared to conventional gasoline vehicles, hydrogen at a cost of $4.50 /gge is competitive on a cents per mile basis to gasoline at $1.90 per gallon, untaxed.