



Technology Focus Area

Co-production of Hydrogen and Electricity

Among the challenges in using hydrogen as a transportation fuel is development of a hydrogen-fueling infrastructure concurrent with the deployment of hydrogen vehicles. Distributed generation of hydrogen has been proposed as a solution. However, the low-volume hydrogen requirements in the early years of fuel cell vehicle deployment and the sporadic nature of vehicle fueling make the economic viability of stand-alone hydrogen generators challenging. A significant challenge for fueling station developers will be minimizing the financial risk associated with stranded capital assets. A potential solution to this “stranded asset” problem is high-temperature fuel cells that can produce both hydrogen and electricity. Co-production of electricity and hydrogen offers a potentially lower cost option for the hydrogen infrastructure. This concept has the potential to meet the DOE hydrogen cost targets, while producing ultra clean electricity for less than \$0.10/kW.

Fuel Cell Energy, Inc. is installing and operating its carbonate Direct Fuel Cell® (DFC®) Power Plants in USA, Europe and Asia. DFC® power plant operation has been demonstrated with a variety of hydrocarbon fuels, such as natural gas, digester gas, methane, propane and biogas with an electrical efficiency of 47%. The fuel cell system produces hydrogen internally from the hydrocarbon fuel while providing cooling for the fuel cell stack. Unutilized excess hydrogen separated from the anode exhaust is available for other uses. The electricity produced on-site can power the local grid, while hydrogen can be used for fuel cell vehicles or industrial customers. The fuel cell power plant cost is offset by the power sold to the grid while the by-product hydrogen is available “free” except for the cost of separation from the diluents.

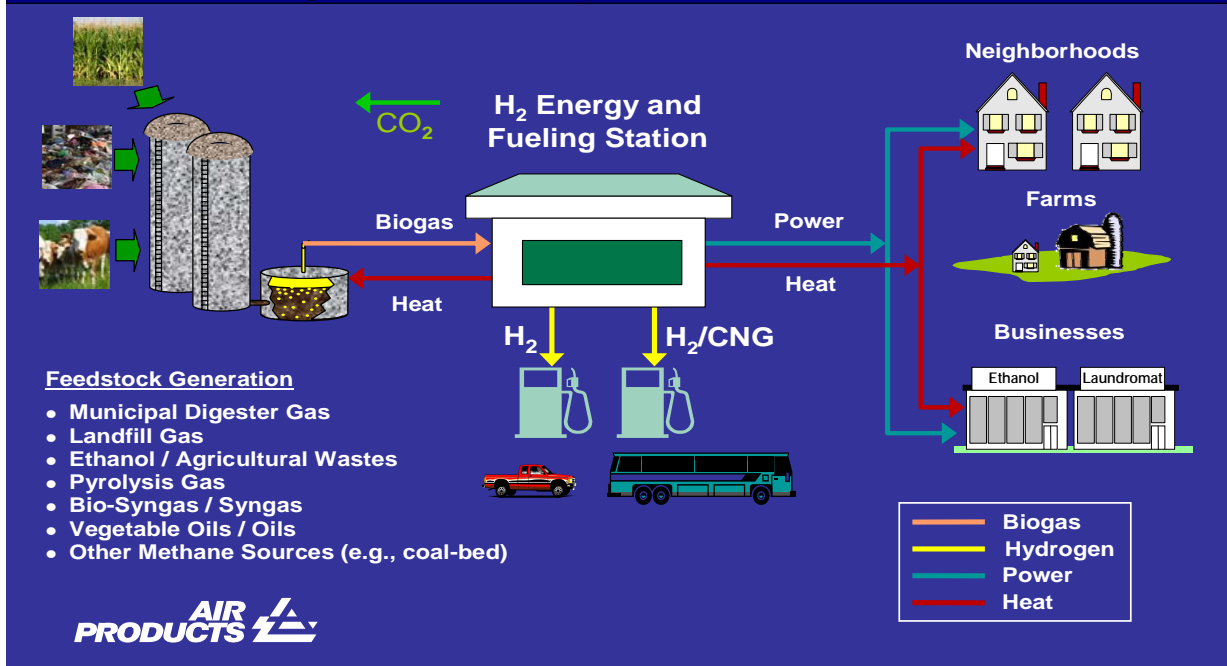
One of the major techno-economic barriers to hydrogen infrastructure is the delivered-cost of hydrogen to the fuel cell vehicle. The ability to generate multiple products with flexibility to match hydrogen and electricity production to on-site demand improves the overall economics of hydrogen production and distribution. On-site generation can potentially eliminate the costs associated with hydrogen distribution and delivery.

FCE’s immediate goals for the hydrogen co-production technology development include

- Integration of a molten carbonate fuel cell (MCFC) with a hydrogen generation unit and a sewage treatment digester at commercial scale.
- Use of both natural gas and digester gas for simultaneous power and hydrogen production.
- Over all system efficiency above 70%
- Heat recovery for
- Demonstration of a Hydrogen Energy Station configured to operate with multiple renewable feedstocks.
- A commercial DFC300® plant modified for separation and purification of hydrogen from the fuel cell anode exhaust needs to be demonstrated.



Hydrogen Energy Station Vision - High-Efficiency and Renewable -



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