



Request for Information

Date: October 30, 2009

Subject: Request for Information (RFI) on performance and cost requirements for fuel storage subsystems for early-market fuel cell applications.

Description: The U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) has issued a RFI seeking input from prospective fuel cell system users, fuel cell component and system suppliers and other stakeholders on performance and cost requirements for fuel storage subsystems for near-term, early market fuel cell applications.

Program Manager / Area: Dr. Sunita Satyapal, Acting Program Manager, Fuel Cell Technologies Program, DOE-EERE.

Background: The EERE Fuel Cell Technologies Program (the Program) seeks to advance the development and deployment of fuel cells for power generation in a variety of stationary, portable, and transportation applications. In support of this goal, EERE funds a broad range of hydrogen and fuel cell technologies research, development and demonstration (RD&D) activities. A detailed description of the program, including technical and cost targets, can be found in the Multi-Year Research, Development and Demonstration Plan.¹

The Program is currently working to identify appropriate performance and cost requirements for fuel storage subsystems for near-term, early markets for fuel cells. The requirements will be driven by consumer/user expectations for the various applications, rather than by the operating parameters or constraints of specific technologies. Cost and performance requirements and their accompanying time-based targets will be set with industry and market input and will help guide the RD&D required for improvements in physical storage systems and/or solid state storage materials, designs, and systems.

The Program has identified the following priority early market fuel cell application categories as highly important to market transformation for fuel cell technologies:

Mobile: <10 kW

Service/utility vehicle applications such as fork lifts, material handlers, and airport vehicles

¹ http://www1.eere.energy.gov/hydrogenandfuelcells/mypp/pdfs/fuel_cells.pdf

Stationary Power: 1-10 kW

Remote (e.g. off-grid) applications such as weather monitoring, sensors, instrumentation, communications, and highway information signals

Back-up power applications such as telecommunications uninterrupted power supply (UPS), computing, instrumentation, and emergency power

Residential applications for prime or auxiliary power

Other near-term applications which may also be addressed in response to this RFI include the following:

Mobile Power: 1-10kW

Auxiliary Power Units (APUs) applications such as highway long-haul trucks, portable floodlight sets, refrigerator trucks, construction, emergency, and recreational vehicles

Stationary Power:

>10kW Commercial combined heat, power, and hydrogen production (CHHP) applications such as apartment and office buildings, strip malls, small business, and light industrial.

1-10kW Residential CHHP applications such as single-family homes

Portable Power:

<500W Hand-held applications such as communications, computing, entertainment, image processing, toys, medical, sensor, instrumentation, and battery replacement.

>500W Higher power portable applications such as power tools, communications, emergency power, and instrumentation.

Note: military/defense applications are not within the scope of this RFI due to the extensive RD&D currently being sponsored by the Department of Defense.

Purpose: The purpose of this RFI is to solicit input from prospective system integrators, potential end-users and consumers, fuel cell component and system suppliers, and other stakeholders on proposed performance, durability, and cost requirements for fuel storage subsystems for early market fuel cell applications. This RFI is intended to be “fuel neutral” with the focus on defining the fuel storage needs and requirements for early market fuel cell applications to facilitate successful market transformation in a competitive environment. The primary “fuel-of-choice” for these applications can be (but are not limited to) hydrogen from natural gas, renewable fuels (e.g. hydrogen from wind or solar, biogas) or fossil fuels (e.g. natural gas, diesel fuel, methanol, liquid petroleum gas, etc.). However, overall life cycle costs and emissions and petroleum use should be considered i.e.; single use disposable cartridges with “spent fuel” byproducts are unlikely to be optimum.

Input is requested to define the operating and cost requirements for the early market fuel cell applications discussed above. This information will be used by DOE in a preliminary assessment and ultimate determination of the storage system performance requirements, to guide necessary

R&D work for advanced storage options for these applications. The following parameters have been identified as key to an initial consideration of these issues for the application categories discussed above. Note: In addition to the operating and cost requirements to be determined, the storage system must not reduce overall fuel cell efficiency by more than ~10% if heat is needed to release the fuel.

Fuel Cell System Electrical Demand Requirements (between refuelings) – kWh

Average/nominal fuel cell output power level and required run time between refuelings (Specify both hours and power rating required *e.g.*, 1kW for 10 hours between refuelings = 10kWh).

Fuel Cell System Peak Output Power Level - kW

The maximum output power required for the fuel cell system

Fuel Cell System Transient Response Time – minutes

The required 10-90% (of peak power) and 90-0% (for shut-off) response times of the fuel cell system

Fuel Cell System Fuel-of-Choice and Fuel Quality Requirements

The preferred fuel, if any, for the fuel cell system and any potential contaminant issues that could affect fuel cell performance.

Fuel Cell System Alternate Fuels and Fuel Quality Requirements

Alternate fuels that have the potential to meet fuel cell system requirements and any potential contaminant issues that could affect fuel cell performance.

Storage Subsystem Weight – kg

The maximum allowable weight, if any, for the storage system (specify fuel cell rating, kW)

Storage Subsystem Volume – liters

The maximum allowable volume, if any, for the storage system (specify fuel cell rating, kW)

Storage Subsystem Refueling Time – minutes

The maximum allowable time for refueling (specify average amount of fuel to which this corresponds)

Fuel Release Rates – g/s/kW

The amount of fuel that must be released per second per kW output of the fuel cell

Fuel Delivery Pressure Range – bar

The maximum and minimum operating pressure range required for optimum fuel cell performance.

Fuel Delivery Temperature Range – °C

The maximum and minimum operating temperature range required for optimum fuel cell performance.

System Start-up Time – s

The time required for the FC to provide acceptable power for the application.

Storage Subsystem Cycle Life - # of cycles

The expected useful life of the storage subsystem in terms of number of refill cycles

Storage Subsystem Cost - \$/kWh

The allowable cost, on a per kWh basis, for the storage subsystem (excluding the cost of fuel)

Responses to this RFI are solicited regarding the following questions/issues:

1. Please comment on the above applicable parameters for one or more of the application categories (e.g. stationary, portable, back-up, mobile, etc.) listed in the Background Section of this RFI. The responding organization's (or individual's) best estimate of actual **required** values for these parameters is requested, including current fuel of choice. Please also include a **very** brief statement of the responding organization's (or individual's) qualifications, experience and expertise relative to information requested in this RFI. Note that the names and qualifications of individual respondents to the RFI will not be made public, although participating organizations may be publicly acknowledged.
2. Are the parameters presented appropriate and reasonable? Are there other parameters that would be useful in an initial feasibility assessment?
3. Are the storage options currently available capable of meeting the performance and cost requirements for these applications?
4. What would be the perceived advantages/disadvantages of advanced storage subsystems for these early market fuel cell applications?

RFI Guidelines: Comments in response to this RFI must be provided as an attachment to an e-mail message addressed to **StorageTargets2009@ee.doe.gov**. All responses to this RFI must be delivered electronically to the aforementioned e-mail address using Microsoft Word (.doc) format. DOE would prefer that responses to this RFI be no more than one page in length per each application category with a five page total maximum.

According to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit two copies: one copy of the document including all the information believed to be confidential, and one copy of the document with the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Commercial product descriptions, marketing information and technical presentations/publications should not be included in response to this RFI. DOE will not reimburse costs associated with preparing any documents for this RFI. Note that the intent of this RFI is to provide an opportunity for stakeholders to submit input on targets, and will not lead directly to a Funding Opportunity Announcement. Technical questions may be addressed to **StorageTargets2009@ee.doe.gov**. Comments must be provided by no later than 11:59 PM EDT on January 15, 2010. [Editor's note: The deadline was extended on December 15, 2009.]