White Paper Summary of Interviews with Stationary Fuel Cell Manufacturers

May 2007

by the

California Stationary Fuel Cell Collaborative

Executive Summary

With the growing interest in “green” technologies, fuel cells are poised to move into the marketplace in larger numbers. Fuel cell manufacturers are optimistic that sales will increase substantially over the next couple of years. Fuel cells represent an ultraclean, high-efficiency technology that should be more attractive due to the building momentum to address climate change.

As in previous years, this year’s survey reports information gathered through interviews with key personnel from several fuel cell manufacturers. To maintain the confidentiality of the interviewees, the manufacturer’s data has been aggregated with no specific references to individual companies or products.

Overview

Process

In March 2007, California Stationary Fuel Cell Collaborative (Collaborative) Core Group representatives interviewed major manufacturers of phosphoric acid, molten carbonate, proton exchange membrane, and solid oxide stationary fuel cells. The purpose of the interviews was to determine the current and projected manufacturing capabilities, sales volume, and installation cost of stationary fuel cell power plants in the state of California over the past year and to create a projection of this same information over the next three years. Manufacturers also answered questions regarding the Collaborative, the California marketplace, key customer industries, and government regulations and incentive programs.

The Collaborative conducts the survey annually. In addition to assessing the current and near-term market outlook, the Collaborative uses the information from the survey to identify the actions that the State and the Collaborative could take in order to create a more receptive environment for the installation of stationary fuel cell power plants.

Summary of Survey

Collaborative representatives sent a standardized list of questions (Attachment 1) to each of the subject companies prior to the interviews. Personnel from the California Air Resources Board (ARB) and National Fuel Cell Research Center represented the Collaborative during the teleconference interviews.

The survey asked the manufacturers for information pertaining to:

- Sales for the 2006 fiscal year (ending commonly on December 31st or June 30th);
- Manufacturing capability and sales projections for the 2007, 2008, and 2009 fiscal years;
- Projected product portfolio, price expectations, and warranty/service contract offerings; and
- The targeted industries based on individual business plans.

The information compiled and presented herein reflects a range of fuel cell products. These produc/ represent various sizes, fuel cell types, expected efficiencies, stack and associated equipment life spans, manufacturing strategies, and cost expectations.

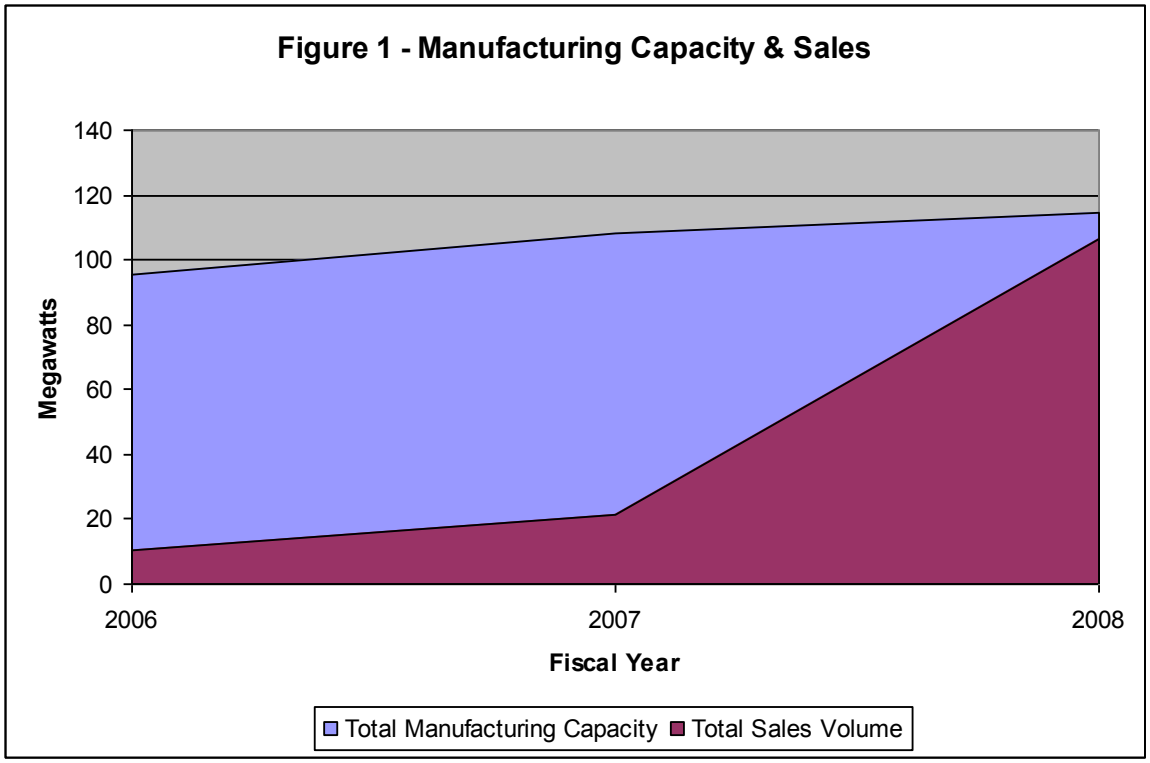
The manufacturers also identified barriers to market entry and facilitation, incentive strategies, as well as opinions on the performance of the Collaborative over the past year and suggestions for the role of the Collaborative in the coming year. This report also summarizes those responses.

Results

Production Capabilities and Sales Potential of the Stationary Fuel Cell Industry

This year's survey of projected manufacturing capacity and sales (Figure 1) indicates the industry's assessment of the future. Current production capacity is approximately 95 Megawatts (MW), projected to increase by another 20 MW in the next couple of years. Although the current sales volume represents about 10 percent of manufacturing capacity, manufacturers anticipate that the production/sales gap will tighten significantly within the next couple of years.

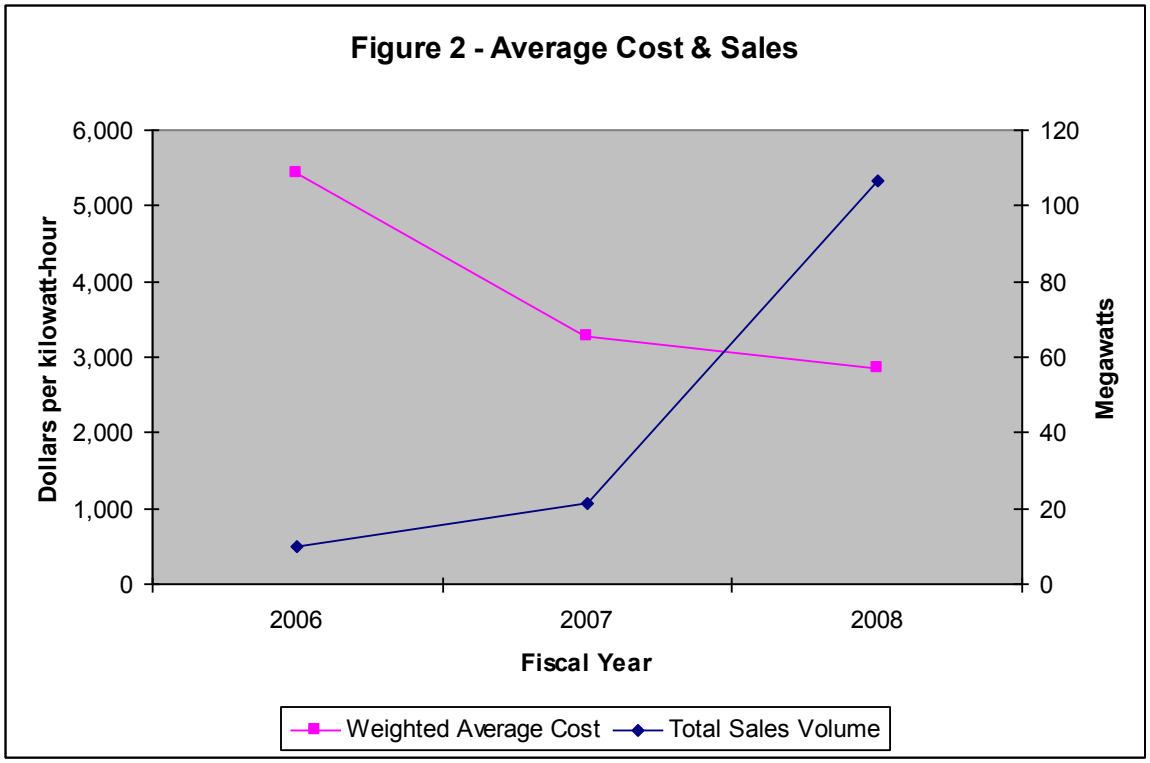
While the increase in projected sales is ambitious, the manufacturers expect growth in sales over the next couple of years for several reasons, including an expected decrease in capital costs, improvements in the technology, and the burgeoning interest in reducing greenhouse gases, for which a fuel cell's high overall efficiency is ideally suited.



Capital Costs

Reducing capital costs of fuel cell technologies remains challenging, although some modest improvements have been realized in the last couple of years. Survey results suggest that significant reduced capital costs—and associated sales gains—are on the horizon.

Figure 2 shows the weighted average cost and the total sales volume outlook for the next two years. To calculate the weighted average cost, staff determined the capital cost per MW for each fuel cell manufacturer, then weighted the overall average according to how many MWs the manufacturer sold. For example, a manufacturer that sold 10 MW of power would be weighted twice that of a manufacturer who sold five MW.



Warranties and Service Contracts

Fuel cell manufacturers—similar to manufacturers of other equipment—provide warranties and service contracts for their products. While the pricing and structure of the warranties vary widely, the effort to provide warranties implies confidence in the products and a strategy to transmit that confidence to customers. The service contracts also help give purchasers confidence in the long-term reliability of the products while spreading the cost of repairs for the units that do not perform up to expectations over a larger base—a sort of "insurance" system for manufacturers and purchasers.

A number of manufacturers expressed that they would be expanding their warranty coverage due to the greatly improved reliability and efficiency of their technologies. They believe this will, in turn, pass a greater confidence on to end users, resulting in increases in sales.

Key Customers

The key customers vary significantly among manufacturers. Some manufacturers are targeting backup power systems, while others are interested in prime-power markets. Fuel cells manufacturers continue to find an ever-expanding market in which fuel cells can be an effective alternative to commonly used technologies.

California Customers

The surveyed companies affirmed the importance of California in their planning and sales. Companies projected California Sales at anywhere from zero to over 50% of total sales.

Incentives, Demonstration Funds, and Rebates

The most significant barrier to widespread fuel cell commercialization remains the high capital cost of installing a system. Companies installing fuel cell systems are faced with a complex decision. Variables include the reliability of the system itself; the capital cost of auxiliary system; the complex incentive, rebates, and tax credit programs; and, in many cases, the fundamental challenge of estimating the future cost of electricity and natural gas or hydrogen.

Manufacturers cited the most important incentive program to be the California Public Utilities Commission's (PUC) Self-Generation Incentive Program (SGIP). While this program offers some basic support for the installation of the stationary fuel cell systems, manufacturers cited areas that could be improved. One common area of concern was that the program is capped at funding systems no larger than one megawatt. Another area of concern is that the SGIP does not include back-up power production.

Deployment

Numerous fuel cells have been installed throughout the state. An interactive mapping of current installations can be found on the Collaborative's website at http://stationaryfuelcells.org/stationary_fc_map/Index.htm. Thirty-nine facilities have stationary fuel cell installations, and another 22 facilities have inactive fuel cells.

The Deployment Committee is actively pursuing a number of other installations of stationary fuel cells from 5 kW to about 12 MW in size. The Committee plans to have a very active role in assisting facilities seeking fuel cells with planning and permitting of installations.

Collaborative Report Card

Companies affirmed the efforts of the Collaborative to bring industry together. This effort was accomplished through various meetings, working groups, and the cooperative efforts the Collaborative facilitated. California's energy market dynamics make it critical for the industry to have a unified presence and voice. The results of this type of unified effort can be seen in the extension of the PUC's SGIP.

This unified approach is critical to ensuring the representation of the fuel cell industry in California. A unified approach is also critical as other states will look to California's lead in the industry for implementation strategies to promote clean air technologies.

Manufacturers mentioned the need for more educational and outreach efforts. A main thrust of this effort should be directed to policy and decision makers. Also, efforts need to be made to simplify permitting by educating fire marshals and building inspectors.

It was decided previously for the Collaborative to develop a storybook educational package that could be used by all members as part of outreach effort while keeping a consistent message across all manufacturers. This effort is still ongoing.

Conclusions

The companies surveyed expect significant growth in sales in the next couple of years. The projections indicate that sales should grow to be approximately equal to the manufacturing capacity. As this happens, capital costs per kilowatt-hour should decrease in part due to economy of scale and improvements in technology.

Attachment 1

2007 California Stationary Fuel Cell Collaborative

Survey Questions

5/30/2007

California Stationary Fuel Cell Collaborative
2006 Fuel Cell Industry Survey
March 2007

COMPANY:

Representatives:

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1. What volume did you produce from Jan 1, 2006 – December 31, 2006

	Technology Type	Capital Cost $ / kW	Size of Unit	Total Production Capacity (MW)	Total Sales Volume (MW)	CA Sales Volume %

What are the number of units sold?

2. **Under your current business plan, what is the total fuel cell electrical output that you are capable of <u>producing</u> by:**

	Technology Type	Capital Cost $ / kW	Size of Unit	Total Production Capacity (MW)	Total Sales Volume (MW)	CA Sales Volume %

Note: Capital cost does not include installation and is for an electricity only unit.

3. **What are the costs today for an electricity only system for:**
   - **Warranty or Service Contract:**
     -
   - **Stack Replacement (if not included in warranty)**
     -
   - **O&M (does not include fuel costs)**
     -
   - **What is service call rate**
     -

4. **Describe key customers (i.e., the niche or sector) that you are targeting (e.g. opportunity fuels, high heat recovery opportunities, backup, high reliability, military, etc.)?**
   -

5. **Since the last survey, what impact has the Collaborative had on your specific business? The industry?**
   -

6. **Identify specific barriers (e.g., technical, regulatory, economic) that impact your ability to attain the targets that you identified above? For example:**
   - **Access to incentives**
     -
   - **Regulations (e.g. codes & standards regarding interconnection agreements, fire marshals, building inspectors, etc.)**
     -

7. **Identify specific actions that you believe the Stationary Fuel Cell Collaborative can take to address the key barriers that you identified.**
   - **Access to incentives**
     -
   - **Regulations**
     -
   - **Economic**
     -
   - **Labor Force**
     -
   - **Training**
     -
   - **Education / Outreach**
     -
   - **Manufacturing or Assemble in CA incentives**
     -
   - **Others…**
     -

8. **Incentives**
   - **Which are you able (wanting) to utilize**
     -
   - **Are there barriers to accessing any of these**
     -
   - **Have they had an impact**
     -

9. **Describe the nature of your presence in California as well as any planned changes to your presence (identify the target date as appropriate)?**
    -
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10. **Are you pursuing any strategies that link stationary and mobile fuel cell applications? Why? Please describe.**
    -

11. **Given the potential proprietary nature of these questions, please identify which information you provide that constitutes confidential information under California law.**
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