



# White Paper Summary of Interviews with Stationary Fuel Cell Manufacturers

September 2008

by the

California Stationary Fuel Cell Collaborative

[This page intentionally left blank]

## **Executive Summary**

In April 2008, California Stationary Fuel Cell Collaborative (Collaborative) representatives interviewed major manufacturers of phosphoric acid, molten carbonate, proton exchange membrane, and solid oxide stationary fuel cells.

In 2007, fuel cell manufacturers had a wide range of commercial products. Small unit manufacturers (1kW to 30kW) are currently selling Proton Exchange Membrane (PEM) fuel cells for use as stationary backup power, stationary prime power, and motive power. Large unit manufacturers (200kW to 1000kW) are currently selling Phosphoric Acid (PAFC) and Molten Carbonate (MCFC) fuel cells for use as stationary prime power with the option to utilize Combined Heat and Power (CHP).

Over the last year, 10 megawatts of fuel cells were sold at an average price of \$4.50 per watt. The industry as a whole anticipates an increasing volume and decreasing price next year and over the following years. By 2010, the industry's goal is to sell over 100 megawatts MW at about \$3.00 per watt.

## Overview

### **Process**

In April 2008, California Stationary Fuel Cell Collaborative (Collaborative) representatives interviewed major manufacturers of phosphoric acid, molten carbonate, proton exchange membrane, and solid oxide stationary fuel cells. Manufacturers were given a hard copy of the survey and about a week later were interviewed via teleconference by multiple Collaborative members. The notes were combined and condensed to form a dataset for the survey. Proprietary and manufacturer specific information was removed from the dataset. This report was written based on that dataset. The report was reviewed by members of the Collaborative and Industry participants to verify accuracy and privacy. A final copy of the report can be found on the Collaborative website, [www.stationaryfuelcells.org](http://www.stationaryfuelcells.org).

### **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 (NFCRC), representing the Collaborative, interviewed the subject companies via teleconference.

The survey asked manufacturers for information pertaining to:

- Sales in 2007;
- Manufacturing capability and sales projections for the 2008, 2009, and 2010 fiscal years;
- Projected product portfolio, price expectations, and warranty/service contract offerings; and
- The targeted industries based on individual business plans.

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.

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

The Collaborative conducts this 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.

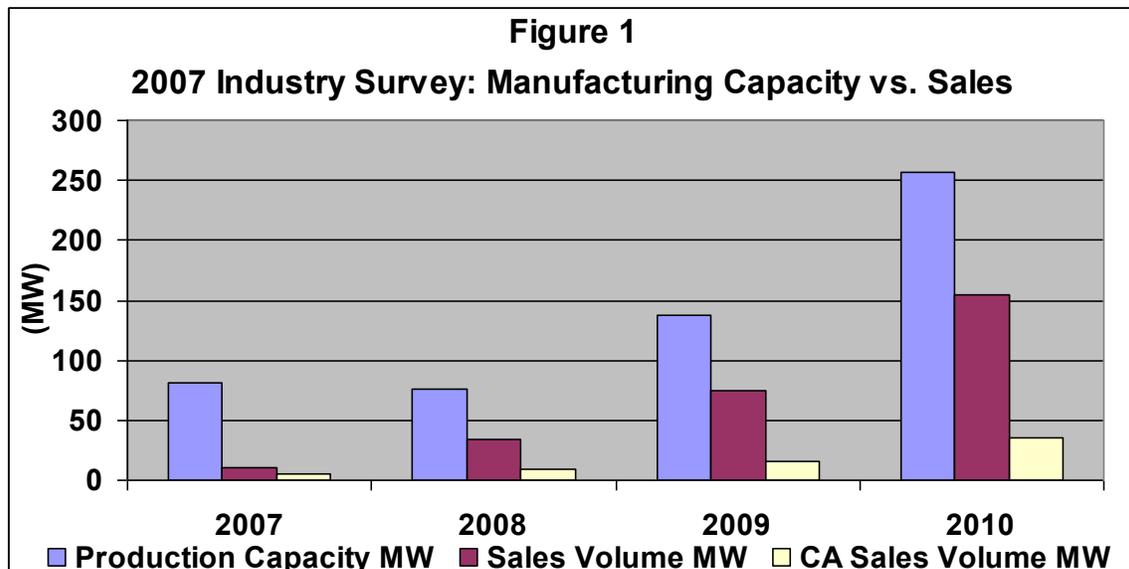
## Results

### Industry Products

In 2007, manufacturers had a wide range of commercial fuel cell products. The small unit manufacturers (1kW to 30kW) are currently selling Proton Exchange Membrane (PEM) fuel cells for use as stationary backup power, stationary prime power, and motive power. The small units currently operate on hydrogen gas, or reformed natural gas. The large unit manufacturers (200kW to 1000kW) are currently selling Phosphoric Acid (PAFC) and Molten Carbonate (MCFC) fuel cells for use as stationary prime power with the option to utilize Combined Heat and Power (CHP). The large units currently operate on hydrogen gas, reformed natural gas, anaerobic digester gas and other hydrogen rich waste streams.

### Production Capabilities and Sales Potential

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 80 Megawatts (MW), projected to increase to over 200 MW in the next couple of years. Current sales of 10MW represent about 15% of the production market capacity, and are expected to increase to more than 50% of the production capacity.

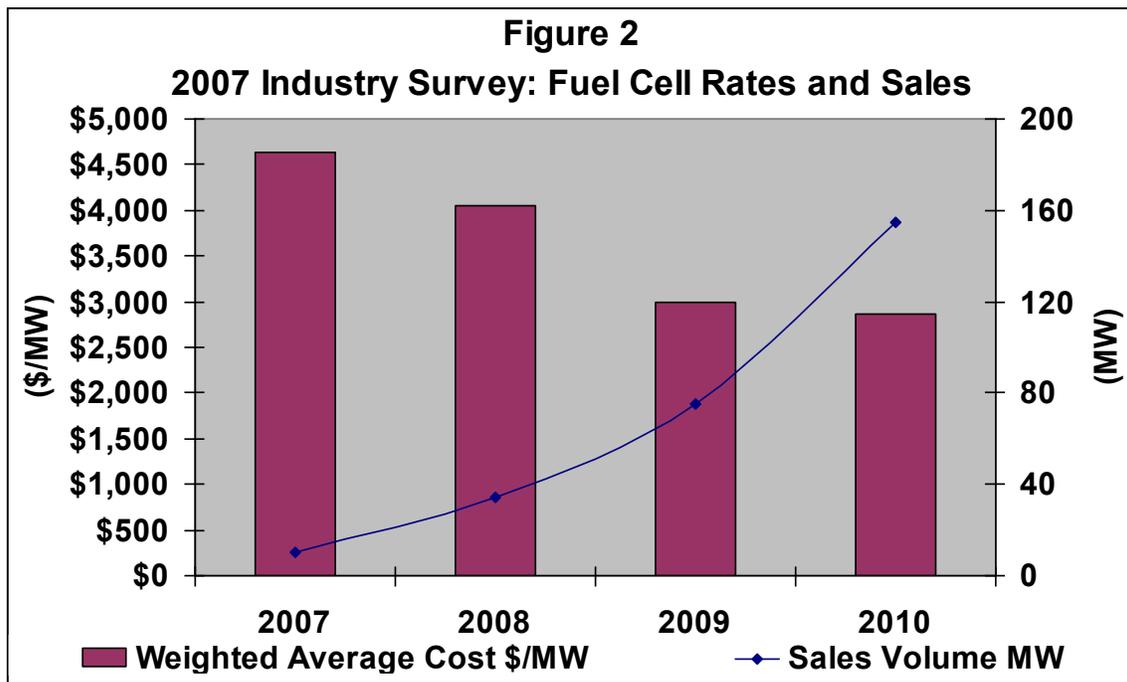


The manufacturers expect growth in sales over the next couple of years for several reasons, including an expected decrease in capital costs, improvements in the technology, and the continued interest in reducing greenhouse gases and criteria pollutants, for which a fuel cell's high overall efficiency and clean operation is ideally suited.

## Capital Costs

Reducing capital costs of fuel cell technologies is an important factor in commercialization. Improvements have been realized over the last few years as capital costs continue to fall. Survey results suggest that significant reduced capital costs—and associated sales gains—remain on the horizon.

Figure 2 shows the weighted average cost and the total sales volume outlook for the next three 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.



Capital cost has continued to decrease as predicted in past surveys and is expected to continue to become more competitive as sales volume increase. Sales have increased over time, but have not reached the expected rates from previous surveys.

## Warranties and Service Contracts

Fuel cell manufacturers—similar to manufacturers of other equipment—provide warranties and service contracts for their products. All manufacturers surveyed provide either warranties or service contracts with their commercially available products. Replacement of the fuel cell stack is included in these plans. These plans imply a confidence on behalf of the manufacturers in their product.

## Key Customers

The key customers vary significantly among manufacturers. Manufacturers are interested in providing prime power, backup power, motive power, combined heat and power, and renewable power to a variety of customers including utilities, industrial, telecommunication, government, mixed

commercial, business, and consumer. Fuel cells manufacturers continue to find an ever-expanding market in which fuel cells can be a clean and effective alternative to commonly used technologies.

### **California Customers**

The surveyed companies affirmed the importance of California in their planning and sales. Of the total sales surveyed for 2007, nearly 50% of the sales were in California.

### **Incentives, Demonstration Funds, and Rebates**

Three main incentive programs are available in California: Self Generation Incentive Program, Emerging Renewables, and the Federal Tax Credit. The increase in funding by the Self Generation Incentive Program to three megawatts will help with future projects. However, there is little to no renewable hydrogen available to qualify for the Emerging Renewables program and backup power is exempt from the Self Generation Incentive Program.

Currently, tax credits are the most widely used incentive however industry members would prefer to see rebates instead. Tax credits do not lower the purchase price of a fuel cell whereas rebates result in a lower first cost.

### **Deployment**

All respondents mentioned a need for a unified set of codes and standards for fuel cell technology. Currently, there is no single set of standards across municipalities. A common set of standards would make it easier and less time consuming to site and install fuel cells.

### **Collaborative Report Card**

Most respondents agreed that the collaborative has led to a more educated customer base. The collaborative has also facilitated relationships between collaborative members and the public sector.

### **Conclusion**

The Fuel Cell industry continues to grow with an increase in sales this year compared to previous surveys. With anticipated decreases in price and increase in units sold, the industry expects to continue to grow in the years to come.

## **Attachment 1**

2008 California Stationary Fuel Cell Collaborative Survey Questions

**2008 Fuel Cell Industry Survey**

**Company:**

**Representative:**

**1) What Volume did you produce from Jan 1, 2007 to Dec 31, 2007**

Technology Type	Capital Cost \$/kW	Size of Unit (kW)	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 producing by:**

Technology Type	Capital Cost \$/kW	Size of Unit (kW)	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**

- 

- **Operation and Maintenance (not including fuel costs):**

- 

- **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?**

- **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 dates as appropriate).**

•

**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.**

•