

Fuel cell stationary power business development

Scott A. Weiner

Ballard Generation Systems, Unit C, 4242 Phillips Avenue, Burnaby, BC V5A 2X2, Canada

Abstract

This paper discusses the recent business and product development activities at Ballard Generation Systems. Ballard Generation Systems was formed in late 1996 as a venture between Ballard Power Systems and GPU International. The focus of this venture is to commercialize fuel cell power plants for stationary applications using Ballard's polymer electrolyte membrane (PEM) fuel cell. This paper will discuss the framework and structure of this model strategic alliance for fuel cell commercialization. This paper will provide the perspective and rationale of Ballard Power Systems in developing this unique business relationship to bring its PEM fuel cell power plants to market. It will also provide insight into the GPU International viewpoint on the fuel cell business and the GPU International rationale for their investment. As well, this paper will discuss the benefits Ballard and GPU International expect to achieve through this relationship. Having recently completed the construction and commissioning of the prototype of the company's first commercial product, this paper will discuss recent achievements of the company's product development activities as it moves towards product introduction. © 1997 Elsevier Science S.A.

Keywords: Solid polymer fuel cells; Stationary applications

1. Introduction

The fuel cell industry is in transition as it moves from an industry focused on developing technology to become an industry focused on the business of fuel cells and their market applications. Today, with significant technical advancement behind it, the fuel cell industry is shifting its focus to market drivers such as cost and reliability. These drivers are at the forefront of many companies' thinking as they introduce fuel cell products for a clean, growth-oriented future. Fuel cell power plants designed to meet emerging market needs will exhibit commercial advantages over conventional power sources, creating profitable business opportunities for manufacturers, customers, and users. Companies that successfully enter and create a long run profitable business will have many things in common. Perhaps the most significant of these will be the understanding that a successful business cannot be built on technology alone. A successful business needs to offer reliable products that provide customer value at a reasonable cost.

2. Ballard generation systems

Ballard Generation Systems (BGS) understands these fundamental building blocks of a successful business. The

company focuses all of its activities on developing reliable products that deliver significant value to customers. BGS, a venture between Ballard Power Systems (Ballard) and GPU International (GPUI), is the Ballard subsidiary actively commercializing polymer electrolyte membrane (PEM) fuel cell products for stationary electric power products in the 1 kW to 1 MW capacity market. Following Ballard's long standing strategy of forming strategic alliances, BGS was created in December 1996 after the convergence of the unique visions of both Ballard and GPUI. At that time, Ballard was working to develop a business based on its PEM stationary power plant development program and GPUI was seeking growth opportunities in emerging technologies. Ballard's technology and GPUI's market knowledge proved to be a solid platform for the creation of the strategic partnership venture. Under the terms of the agreement, GPUI will invest US \$23.25 million over 2 years in return for a 19.3% interest in the company and its fuel cell power plant business [3].

BGS' business is the development, manufacture and sale of PEM fuel cell power plants for stationary electric power applications. The PEM fuel cell stacks that will be integrated into BGS products will be developed by Ballard. BGS will leverage its strengths in systems integration to create successful products around PEM fuel cells to meet emerging world power generation market needs. Ballard

PEM fuel cells will be integrated into BGS products for these changing power markets.

Today, BGS is actively responding to market opportunities in North America that have emerged as a result of electric industry restructuring and the evolving perceptions of the role of fuel cells by many in the industry. Although some members of the industry take a traditional utility point of view and look at fuel cells as a threat to their business, others are recognizing the evolving market as the threat. These companies view fuel cells as an opportunity to expand their business activities and serve their customers in ways that provide new opportunities for growth and earnings. These energy providers who view fuel cells as a business enabler intend to expand their market presence by adding fuel cells to their portfolio of generation technologies and energy services. In addition to the evolving utility industry, many other markets for BGS products are emerging. Among these are energy services companies that will seek to provide their customers with power quality solutions built around fuel cells. In addition, companies on every continent are expressing their interest in fuel cell options and BGS product solutions for providing their customers with value added energy products and services.

Both Ballard and GPUI expect to derive significant benefits through introducing BGS products to world energy markets and building the BGS business. The union provides GPUI with an exciting opportunity to obtain earnings through its investment, increasing value provided to its shareholders, while bringing expertise in world energy markets and an understanding of evolving user requirements to BGS [2]. The company is following Ballard's long standing strategy of maximizing growth opportunities by leveraging the combined strengths and capabilities of the strategic partners to create a broader market position. The company anticipates it will build a growing, successful and profitable business by combining Ballard's PEM fuel cells with GPUI's experience in the commercialization of innovative energy products and expertise in the world energy business. In addition to the market strength brought by GPUI, BGS anticipates adding a partner which will infuse manufacturing capability into the company.

BGS recognizes that while solid technology is a key component of a product's success, a successful company or product cannot be built on technology alone. There are many examples where differing technologies are introduced for an application and the technology recognized as superior for the application ultimately loses in the marketplace. Whether the technology is introduced for consumer markets or for the commercial setting, the needs of the market will determine the winner. In fact, for some applications, one technology has emerged as the market leader in consumer markets while another is the leader in commercial markets. This illustrates that the key to success is more than good technology, it is a distribution strategy that resonates in the marketplace combined with products that deliver value through their features, quality and price. BGS will build

its success on the quality and reliability of its products, and by providing excellent service and value to its customers at a reasonable cost for the value received.

As BGS prepares to enter the commercial marketplace, the company sees exciting market opportunities for itself, its partners, and its customers. The company's initial 250-kW product will allow energy companies to provide customers with a reliable, high quality power supply which can be located at their site. These units will be used in a variety of applications including premium power for customers requiring high quality electrical power for sensitive equipment, commercial and industrial distributed power applications, and power for locations remote from the central grid. As BGS grows its business, other products built around Ballard's fuel cells will be introduced for existing and emerging world energy markets.

3. Recent achievements

BGS recently marked its most significant achievement since its inception with the commissioning of its prototype natural gas fueled PEM power plant (Fig. 1) [1]. The prototype measures approximately $2.4 \times 2.4 \times 7.3$ m ($8 \times 8 \times 24$ ft) and holds all required system components – fuel processing, power conditioning, and cooling – within a single package. The unit has reached a peak output of 213 kW, surpassing the prototype's design output capacity of 190 kW. It has also exceeded the prototype design electrical efficiency of 31%, reaching an efficiency of 34%, both LHV. This power plant is the world's largest PEM stationary power plant and includes the world's most powerful PEM fuel cell stack which was developed and manufactured by Ballard. In addition to being the highest capacity PEM fuel cell stack ever manufactured, this stack (Fig. 2) incorporates numerous technical achievements. The high voltage stack operates at between 500 and 700 V, resulting in high efficiencies when connecting the fuel cell power to the electric grid. This stack also incorporates the use of plastic components, significantly reducing its cost and showing a clear path to reaching cost targets for commercial production and sales.

During the next 18 months, the prototype will go through a series of performance tests as the company prepares for the development and manufacture of its next generation units for field testing. BGS' field testing program is planned to begin during 1999 and will be made up of a number of units deployed with the assistance of the company's strategic market allies. Commercial sales are planned to begin after the completion of the field testing program and are targeted for 2001.

In addition to the natural gas fueled 250-kW power plant, BGS plans to introduce extensions of the product which will include operation on other fuels. These other fuels will include propane and anaerobic digester gas from waste water treatment facilities. As BGS moves towards the mar-



Fig. 1. Prototype natural gas fueled PEM power plant.

ket introduction of its 250-kW product, the company is also evaluating additional market opportunities and developing other products for a variety of applications. BGS intends to offer a range of products addressing a market defined as 1 kW up to 1MW in capacity, providing its customers with a broad array of products to generate non-intrusive fuel cell power.

BGS is growing rapidly as the company increases its activities in the drive to introduce its products to the marketplace. The company recently expanded its development facility by approximately 1900 m² (20 000 ft²) and expects

to double its workforce over the next year. BGS is also evaluating locations in British Columbia for its pilot production facility. Commercial production facilities are planned in locations appropriate for serving global markets.

4. BGS vision

BGS is preparing to enter exciting markets around the globe. By leveraging the strengths and capabilities of its partner organizations, BGS will build its business around



Fig. 2. Stationary PEM fuel cell.

emerging market opportunities, creating a broad market position. The company recognizes the evolving needs in today's electrical power markets and will meet these needs with products built around PEM fuel cells supplied by Ballard. BGS products will give energy providers throughout the world the opportunity to offer their users PEM fuel cell power that is generated at, or close to, the user's site. These products will include a variety of capacity ranges and options to operate on various fuels and will provide energy users with flexible, clean, non-intrusive fuel cell power.

Ballard's PEM fuel cell technology, however, will be only one of the building blocks that will distinguish BGS and its products. In addition to technological strength at the fuel cell level, the company will build its global position through leveraging its strength in systems integration to develop successful products for international markets. BGS will further develop its fuel cell systems integration expertise while it develops strengths in manufacturing and

service. These strengths will be built through BGS' strategic alliances and will form the base of reliability, reasonable cost, and value, on which all BGS products will be built.

BGS will also strive to continue the history of innovation that began when the company existed as Ballard's Stationary Power Systems development group. This history of innovation will embody itself in the products developed and manufactured at BGS, the company's internal processes, and in its relationships with its partners and customers. Innovation and reliability will become hallmarks of BGS as it works with its market allies to build a profitable, growing business.

References

- [1] Ballard Generation Systems, *News Release*, August 1997.
- [2] J. Torpey, *Utilities and Perspectives*, 4(19) (1997) 1.
- [3] Ballard Power Systems, *News Release*, December 1996.