Brilliant Light Power – SunCell® Validation Reports June 2016

The urgency of climate change and growing global energy requirements necessitate zero-emission energy innovations for the $6 trillion energy market. Brilliant Light Power has demonstrated such a breakthrough in zero emission energy development, which is dramatically more efficient, safer, scalable, and cheaper than existing technologies. The independent validation reports, utilizing a series of methods, have demonstrated million watt plus (1 MW+) power levels in a volume of less than that of a coffee cup from highly compact laboratory systems.

The technology validation demonstrates the SunCell® has achieved its power targets in the laboratory and is ready for commercial system development and testing. The data collected provides statistical confidence that the SunCell® is capable of providing 10 kW, 150 kW, 250 kW, and 350 kW net electrical power systems. This validation effort helps Brilliant Light Power now focus development activities to meet customer expectations for cost, reliability, and durability.

Four validation methods were employed to substantiate the SunCell® reaction power levels. These test results all demonstrate substantial net power when compared to reference reactions (141 kW to over 1 MW net). The highlights of the four techniques are:

- **Absolute Total Optical Power of Ignited Hydrated Silver Shots Recorded over the Spectral Range from Extreme Ultraviolet to Infrared Wavelengths.** 514 kW of optical power was produced by a tiny hydrated silver shot due to the hydrino reaction. This result was extraordinary considering the peak power was 1.3 MW coming from a fuel shot having a volume of 10 millionths of a liter triggered by the ignition power of 25 kW, less than 2% of the peak power generated. It was further remarkable that the radiation was essentially all short wavelength (high energy) in the EUV and UV range with essentially no visible or near infrared light.
- **Absolute Ultraviolet Power Spectrum of Ignited Hydrated Oxide-Doped Silver Shots.** Ignited partially hydrated oxide-doped shots showed optical power in the ultraviolet of up to 689,000 W that exceeded the ignition input power of 25 kW by a factor of 28 even considering that the UV light power represents only about 25% of the total optical power extending to 10 nm. Suppressing the hydrino reactant atomic hydrogen essentially eliminated the optical power as predicted based on the atomic hydrogen rather than molecular hydrogen dependence of the hydrino reaction.
- **Calorimetry of Solid Fuel**: This thermal power and energy test verified the measured optical powers and energies of single solid fuel shots. The total thermal power levels of over 300 kW were limited by the size of the test cell. A subsequent test with a 2 times larger test cell produced 440 kW. The tests were carried out in a commercial water bath calorimeter using 80 mg, 2mm diameter silver shots with a small amount of partially hydrated oxide doping run under an

95% argon and 5% hydrogen atmosphere. The shots were ignited in the water-submerged cell. The energy was determined by the temperature rise of the known amount of water in the bath, and the average power was determined from the energy released and the event duration.

- **Thermal Burst Power Measurement in Continuous Generator**: The tests confirmed the feasibility of 1.5 MW continuous power generation with a total 8.6 kW input power to the ignition electrodes, electromagnetic pump, and inductively coupled heater used for startup and power calibration. Megawatt scale plasma power was generated when a small amount of a very stable oxide injected with a highly conductive, inert, molten silver matrix was allowed to react with an atmosphere of 3% hydrogen and 97% argon to form the hydrino reaction catalyst and atomic hydrogen in an ignited arc plasma. The insignificant input power was maintained constant, and output power increase with the addition of the oxide to initiate the hydrino reaction was measured by the dramatic relative increase in the thermal response of a water coolant loop, heat exchanger about the cell body and components. The immense hydrino reaction power melted the 3.7 mm high-temperature stainless steel vessel walls in seconds. Commercial systems will incorporate high temperature refractory materials and control the reaction power to run for a projected two decades. The results demonstrate the feasibility of power densities in excess of those required to enable any planned SunCell power generator.

The testing provides insight into the breakthrough hydrino reaction power levels in the 1 MW range. However, this power must be converted into electrical power for end customers. Brilliant Light Power has developed simple, reliable, proprietary, and cost effective solutions for the SunCell® power conversion to electricity.

The SunCell® operates like an incandescent light bulb. The optical plasma (extreme ultraviolet or ultraviolet range) is contained in a tungsten sphere (blackbody radiator), which then radiates power in the visible light range. This visible light is at intensities of thousands of times that of the Sun and is converted to electricity by photovoltaic cells. Super intense blackbody radiation is critical, since this allows the SunCell® to employ commercially available high concentration photovoltaic (HCPV) cells to produce electrical power at amazing low costs per kW (~$60 per kW versus $1980 per kW for conventional PV). The SunCell® commercial design harnesses the power of thousands of Suns, providing clean, safe, and cost effective energy.

A barrier for any breakthrough technology is commercial design complexity and cost. The SunCell® utilizes existing commercial technologies, components, and materials that are readily available and cost effective, such as copper, tungsten, HCPV, cooling systems, controllers, supercapacitors, electromagnetic pumps, inverters, inductively coupled heaters, silver, etc. The commercial design uses simple processes, fabrication, and construction techniques. Prototype designs are estimated to cost less than $100 per kW, with continuous cost reduction for commercial products at high volume.

The SunCell® is designed for inherent reliability, safety, and durability. The process is fully closed, except for the water (fuel) supply. There are no moving parts. Commercially proven components are being used extensively. The reaction is very stable and controllable, and as shown in one test, it will cease if the spherical blackbody radiator losses integrity. Operating pressures are expected to be low, under 10 atmospheres.

A key differentiating factor for the SunCell® is a credible pathway from technology demonstration to rapid prototype demonstration, followed by commercial deployment. The SunCell® prototype and commercial designs are well developed at this stage. Suppliers, with expertise in design and production, are engaged to handle the transition from laboratory to end customer use. Brilliant Light Power will continue to leverage its rapid development capabilities to provide ongoing innovation.

Brilliant Light Power plans to fabricate and assemble prototype SunCell® systems within several months. Subsequent investments are based on known technology and infrastructure requirements, due to the recent test results and commercial design progress. In conclusion, when fully developed the SunCell® will be ready to rapidly replace existing mobile and stationary power generation technologies; providing affordable energy to communities throughout the world without a large capital investment and environmental impact.

Reference Reports:

- Solar City Q1 2016 Earning Report. Installation PV cost less Sales and G&A of $1.98 per watt.
- Validation of SunCell® Technology, K.V. Ramanujachary, Professor - Department of Chemistry and Biochemistry, Rowan University, Glassboro, NJ. May 16, 2016.