

## Following The Critical Path: An Update On Global Thermoelectric's SOFC Technology and Product Development

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Global Thermoelectric Inc. is a leading developer of SOFC technology and systems for stationary applications. Global has been optimizing intermediate temperature (700-800°C) planar anode supported SOFC technology since 1998. As cell development has matured, significant complementary advances in stack performance and system development have been accomplished.

Global's approach to SOFC commercialization is to assign paramount importance to the optimization of underlying enabling technology (cells, stacks). This "critical path" approach focuses effort on overcoming the priority challenges of commercializing SOFC technology. A complementary product development focus provides the impetus to reduce costs and transform science into technology suitable for multi-market applications.

Accordingly, with its focus on advancing cell and stack design and performance, the Company has achieved significant progress in this regard, including:

- Global has demonstrated an integrated cell manufacturing process with a 90% yield rate scalable to high volumes (Figure 1).
- Single repeat unit short stack testing, using randomly selected 10X10 cm. *production* cells, have demonstrated a power density of 1.4 W/cm<sup>2</sup> (at 0.7 V and 750°C) (Figure 2).
- Ongoing long-term cell testing, exceeding 6,800 hours of continuous operation, demonstrated that the current production cell can be projected to have at least a 15,000 h service life.
- Long-term testing (in excess of 2,600 h) of Global's current stack design has demonstrated that a stack service life of 15,000 hours of continuous operation can be projected.
- Global is pursuing the development of several new stack designs to improve performance and significantly reduce manufacturing costs. To date, results are on schedule to deliver a new stack for Global's next generation of prototype system by mid-2003.
- Development of several generations of 2 kW natural gas prototype systems. The most recent generation (RP-2) (Figure 3) achieved 2,900 h of operation on natural gas and demonstrated 23% net AC efficiency. In 2003, Global's next system platform is expected to achieve 30% net AC efficiency.

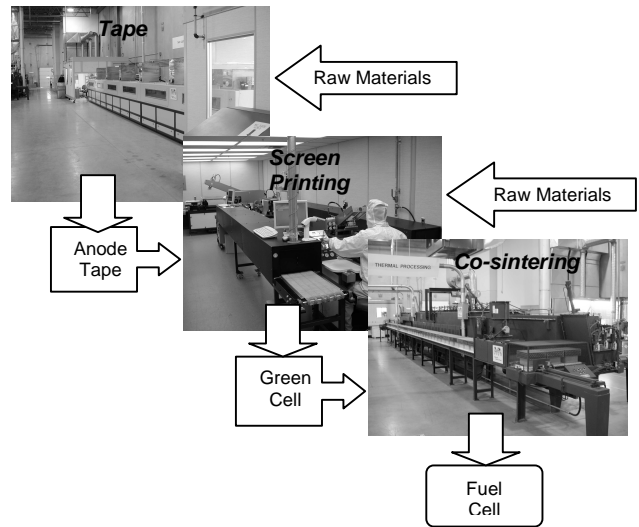


Figure 1: TSC II cell manufacturing process diagram.

Global Thermoelectric Inc. - Single Cell Performance Curves (Maximum Power, 750 C)

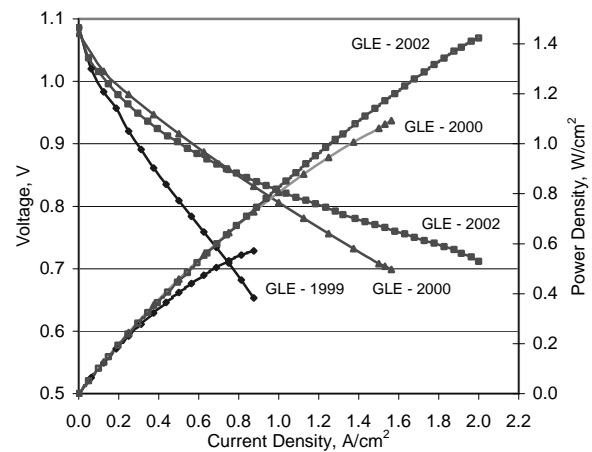


Figure 2: Cell electrochemical performance improvement 1999-2002.



Figure 3: Natural gas 2 kW prototype SOFC system, 2002.