

## Fact Sheet

### Solid Oxide Fuel Cell

**Phipps is the first conservatory in the world to use a solid oxide fuel cell. This energy-efficient, highly-reliable fuel source produces no harmful waste emissions.**

#### The Facts:

- A fuel cell is an electrochemical device similar to a battery, but does not rundown or requires recharging.
- Fuel cells are highly efficient because they directly convert chemical energy into electrical energy without combustion. A fuel cell is twice as efficient as a traditional internal combustion engine and even more reliable.
- Solid oxide fuel cells work when hydrogen and air are fed to the anode and cathode sides of the fuel cell, respectively, where they are kept separated by a non-porous electrolyte. At the cathode, the oxygen in the air is reduced to negatively charged oxygen ions which then move through the electrolyte. On the anode side, hydrogen moves through the anode and with the help of a catalyst reacts with the oxygen ions. The electrochemical reaction between the hydrogen and oxygen ions produces water vapor and releases electrons. The electrons then flow through an external circuit back to the cathode. Individual cells produce a small voltage. Single cells are arrayed into bundles to provide the required level of power.
- Solid oxide fuel cells use a hard, non-porous ceramic compound as the electrolyte, and operate at very high temperatures – around 1800°F. High temperature operation eliminates the need for precious metal catalysts and can reduce cost by recycling the waste heat.
- Fuel cells are incredibly clean power sources, creating byproducts of only heat, water, and carbon dioxide. Phipps will use the waste heat to heat the tempered water system. Future plans include taking the carbon dioxide byproduct and pumping it back into the Production Greenhouses for the plants.
- Very quiet operation eliminates noise pollution. Phipps will keep the solid oxide fuel cell on public display to educate visitors on the benefits of fuel cells.
- Fuel cell to power the Tropical Forest is manufactured by Pittsburgh-based Siemens Power Generation, the leader in fuel cell technology.

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