



HYDROGEN ENERGY

Zeus - Backup Power Systems

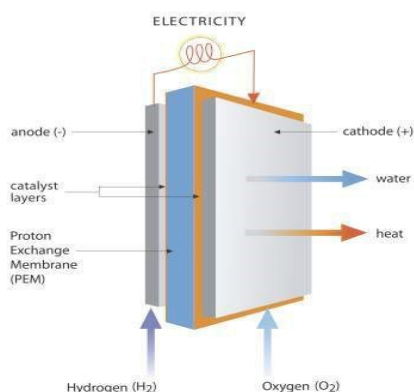
The Zeus Backup Power System is assembled in Australia using Hydrogenics fuel cell technology and Australian manufacturing expertise to create a backup system that is compact in size, uses clean technology and is reliable, starting first time, every time.

Hydrogenics is an international company that has been at the forefront of the hydrogen evolution since 1947 and is now represented in Western Australia by Alberfield.

What is a Hydrogen Fuel Cell?

Hydrogen Fuel Cells (HFC) are devices that use hydrogen to generate electricity through the process of electrolysis. With very high rates of efficiency and zero emissions, HFCs are an excellent sustainable energy solution.

How Does it Work?

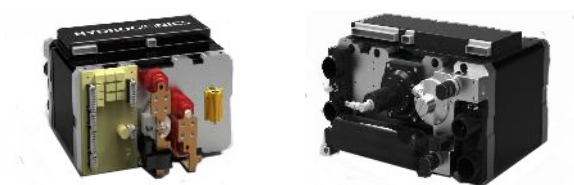


A fuel cell is an electro-chemical conversion device that produces DC electricity, water and heat using hydrogen as fuel and oxygen in the air. It is capable of producing continuous power as long as hydrogen and oxygen are delivered.

Because chemical energy is converted directly to electrical energy, hydrogen fuel cells are highly efficient.

The Fuel Cell

A fuel cell is a compact device that is manufactured to provide specific energy outputs. The fuel cells are incorporated into a fuel cell stack as a scalable power system from 3kW up to 30kW of capacity.



The fuel cell is water cooled, compact and incorporates the primary operating systems on the unit.

The fuel cell offers an instant start in case of an emergency, and will start first time, even if it has not been used for a prolonged period. The hydrogen gas does not degrade over time and is stored in containers that meet international safety standards.

The Zeus Backup Power System

The Zeus backup power system has a small footprint and can be installed inside a building or outside a building in a purpose built cabinet. The hydrogen gas supply is fitted externally and piped into the system. Full online monitoring technology ensures gas supplies are kept up to date and maintenance requirements are advised in advance.



The Zeus Backup Power System

The Zeus 3000; 5000; 8000 and 10,000 models are a DC power system in a single, 19 inch rack, ready to connect into an existing power system.

If required, an AC inverter can be added for an additional cost.

The Zeus 10,000; 30,000 and 60,000 models are AC systems contained in two 19 inch racks. Rack one is the fuel cell and rack two is the inverter and cooling system.

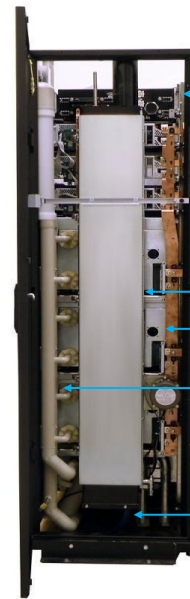
These systems will supply AC power on start up.



Zeus DC models 3kW, 5kW, 8kW and 10kW.



Zeus AC models 10kW, 30kW and 60kW.



- Upper infrastructure interfaces
- Ventilation and exhaust duct, with integrated H₂ supply quick-connect.
- Pre-installed power bus-bars, communications interfaces, cables
- Quick-connect cooling
- Heat exchanger, pump, manifolds, drain

Zeus Backup Power Systems

The fuel cell is dynamic and will respond quickly by creating sufficient power to meet demand. If the demand on a 5kW system is only 2kW, then the fuel cell only supplies that amount.

A fuel cell stack dimensions are approximately 600mm wide, 1017mm deep and up to 2000mm high. The weights vary from 400kg to 650kg.

Model & Capacity	Power output	Power range	Maximum power
		H ₂ Usage/hr	
Zeus 2500 – 3.0kW Fuel Cell	DC	1.5Nm ³	3kW
Zeus 5000 – 5kW Fuel Cell	DC	3Nm ³	5kW
Zeus 8000 – 8kW Fuel Cell	DC	4.5Nm ³	8kW
Zeus 10000 – 10kW Fuel Cell	DC	4.5Nm ³	10kW
Zeus 10000 – 10kW Fuel Cell	AC	6Nm ³	10kW
Zeus 30000 – 30kW Fuel Cell	AC	18Nm ³	30kW
Zeus 60000 – 60kW Fuel Cell	AC	36Nm ³	60kW

Major Components

Fuel Cell Power Module – includes Blower, Water Pump and DC-DC Module

- For Integration on a case-by-case basis, the client will need to determine and confirm the configuration for the following equipment:
 - Batteries;
 - UPS;
 - Inverter;
 - Rectifier;
 - Transfer Switch;
 - Bypass switch (Optional).

Equipment can be recommended and sourced as new for complete integration of the unit, or alternatively, the system can be connected to the client's current equipment. The second option will greatly reduce the cost of the overall solution.

- Hydrogen Fuel Supply – available from an industrial gases provider such as BOC.
- Approximate usage data follows. The chart indicates expected usage if the fuel cell is producing power at its full capacity. Fuel cells are scalable and H₂ usage reduces proportionally to the amount of power being produced.

Standards & Codes

Hydrogenics Corporation (Canada) – manufacturers of the HyPM fuel cell comply with the following codes & standards.

- Module designed to comply with UL FC1, IEC 62282-2;
- Module designed to comply with NEBS GR-1089-CORE (Tests As Per 3.1.3 – FCC Part 15, 3.2.1—Radiated Emissions, 3.2.2 – Conducted Emissions);
- NEBS GR-63-CORE R4-66 R4-68 R4-72 R4-81-83;
- RoHS Compliant.

Installation and Maintenance

Installation is carried out by a Perth-based team trained in all aspects of the work.

Maintenance is minimal and Alberfield will provide a service contract to ensure maintenance is carried out correctly and on time.

Alberfield also offers training to maintenance teams operating in a remote environment so the procedures can be carried out during regular maintenance operations on other equipment.

H ₂ CONSUMPTION				
Approximate hours running at FULL power output*				
Cylinders	3.0kW	5kW	8kW	10kW
1	3	2	1.5	1
2	6	4	3	2
3	9	6	4.5	3
4	12	8	6	4
5	15	10	7.5	5
6	18	12	9	6
7	21	14	10.5	7
8	24	16	12	8
9	27	18	13.5	9
10	30	20	15	10

Note: Estimates rounded to .5hr & based on a H₂ cylinder volume of 5.9m³. Volumetric flow rate referenced to 0°C, 101.3kPa. *Fuel cells are scalable so H₂ use varies with power output.

Alberfield Plus+

As a technical consultancy, Alberfield can assist with assessing existing power consumption, and work with you to design the best system for your current and future backup power needs.

What Next?

The following questionnaire will assist us with designing a suitable backup power system to meet your current and future needs. A draft proposal will be created from this information, and once this is approved, a formal final quotation for supply and installation will be provided.

Please email info@alberfield.com.au to receive an electronic version of this document.

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