

Hydrogen Fuel Cell Applications - Government



Government and military communications networks encompass a wide variety of technologies designed for the optimum ability to keep people safe and complete the mission at hand. Whether the application is E-911 services, video surveillance, radio and repeater sites, flight guidance systems or continuity of operations, each of these technologies share the need for power. In a mission critical situation, loss of power is unacceptable. ReliOn fuel cell solutions are proven to electrically harden critical networks against service-impacting issues.



Reli|On
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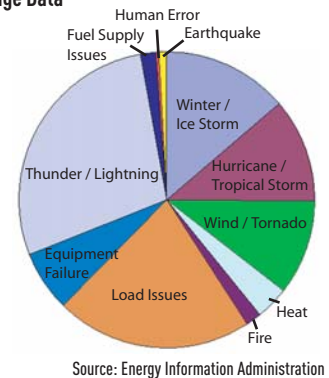
A New Era in Critical Backup Power

Your Sites

Federal and State Government agencies face many challenges to completing their critical missions involving communications, security and response. Keeping power flowing should be the least concern, but without the power needed to keep it running, critical equipment goes off-line and is no longer useful to the operation. Extreme weather, human error and sabotage all pose threats to stable grid power service. According to an average of the 2005 through 2007 data provided by the DOE's Energy Information Administration, these major disturbances caused more than 128 days of lost grid power per year in the U.S. alone, with durations lasting between minutes and weeks, affecting more than 18 million customers. This does not include the day-to-day disturbances we all experience from time to time. Most of these outages center between one hour and two days in length.

When your mission is to get data through no matter what, backup power becomes imperative. Finding a solution that works in all cases is impossible. Even when you have a backup power solution that works fairly well, there can be roadblocks. Assigning key personnel to handle the replacement and repair of batteries and generators takes focus away from the objectives at hand. Redundancy is required to supply consistent power, ensuring an absolute minimum of downtime and providing for stable services by improving reliability and availability. Fuel scarcity in times of disaster can threaten fuel supply for backup generators, and in some regions, the generators themselves are at risk of theft or sabotage.

2005 -2007 Average U.S. Grid Outage Data



Source: Energy Information Administration

	C4ISR	Radio/Repeater Sites	Flight Guidance ILS	Disaster Response	Video Surveillance	Microwave Communications
< 1kW		●	●	●	●	●
2kW	●	●		●	●	
4kW	●	●		●		
6kW+	●			●		

At ReliOn, we understand the difficulties – with over 100 years experience with communications networks on our management team, many of us have been where you are. We provide backup power solutions for communications in several branches of the Federal Government as well as State Agencies – through hurricanes, snowstorms and extreme

cold. In applications needing as little as 200 Watts as well as those needing several kilowatts – for sites needing hours of backup power and those needing days. ReliOn is there.

ReliOn's forward-thinking design provides a fuel cell power solution that gives you the ability to grow as power requirements increase. Modular architecture for power generation and system control enables a highly-reliable, cost-effective backup solution with a seamless upgrade path, maximizing initial investments in fuel cell backup systems, and dramatically reducing the impact on operating budgets.

Electrical Hardening for Mission Critical Applications

Government personnel install power systems both indoors and outdoors, depending on the characteristics of the installation site. ReliOn's fuel cell systems can be installed in a wide variety of configurations, both indoors in standard racks, and in our own outdoor enclosures. Single systems can be partially populated with power cartridges and electronics cards to meet smaller demands. Multiple units can be tied together to achieve higher capacities. As your power needs change, ReliOn's system can adapt quickly, protecting your investment going forward.

Tactical Advantages

In critical equipment installations, excess heat and noise become a detriment to mission security. ReliOn's fuel cell solutions are tactically advantageous due to their low heat signatures and quiet operations. And low maintenance requirements mean fewer trips to equipment sites.

Fuel Supply

ReliOn's fuel cell solution uses industrial-grade hydrogen, available through multiple industrial gas suppliers, and with little competition for supply during widespread outages. With each fuel cabinet providing 48kWh of hydrogen storage, supplying fuel for hours or days becomes a simple issue.

Our Solutions

ReliOn fuel cell systems have revolutionized the application of reliable backup power for critical communications sites. ReliOn's T-1000® and T-2000® fuel cells provide several advantages over traditional backup power methodologies - batteries and internal combustion generators. Fuel cells provide current directly to the DC bus, similar to batteries, but have a significantly increased service life and decreased maintenance costs. Additionally, fuel cell runtime, as with a generator, is a function of fuel storage, but with few moving parts and lower maintenance.

Reliable

- Modular Cartridge Technology® enables selective deactivation of fuel cell cartridges, which adds up to increased reliability of the system.
- Modular, redundant electronics cards improve the dependability of power and interface functions.
- A redundant fan system makes sure that even our one rotating component is ultra-reliable.

Modular

- Patented modular cartridge design means ReliOn is the only company providing easy hot-swappable maintenance in seconds, without tools, and while continuing to provide power to the customer load.
- Changing DC voltage output is as simple as swapping a few electronics cards at the customer site.

Scalable

The T-series products allow the customer to configure the product to suit the load.

- From 200 Watts to 12,000 Watts.
- 8 to 96 kilowatt-hours of hydrogen storage.

Low Maintenance

- Annual air filter inspection.
- Refueling as needed.
- Mean time to repair - minutes.

Environmentally friendly

- Hydrogen in, power and warm water out.
- Low noise signatures under 60 dBA @ 5 feet.

Environmentally hardened

- Temperature range from -40°C to 46°C.
- Field-proven ability to perform during hurricanes, ice storms and other harsh weather.

Monitoring and Control

- Remote / local system configuration and status monitoring for historical and operational data.
- Menu, dry contact, serial port, Ethernet, wireless/wired modems.

Available on the GSA

- Contract #GS-07F-0496N
- www.GSAAAdvantage.gov

	ReliOn	Batteries	Generators
Modular	●	●	●
Scalable	●	●	●
Hot-swappable	●	●	●
Reliable	●	●	●
Simple Design	●	●	●
Environmentally Friendly	●	●	●
Environmentally-hardened	●	●	●
Low Maintenance	●	●	●
Ease of Permitting	●	●	●
Extended Run-time Solutions	●	●	●
Monitoring & Control	●	●	●
Tax Credits	●	●	●

Specifications



T-2000® Rack Mount

Physical	
Dimensions (w x d x h)	21" x 21.5" x 26" 53.3cm x 54.6cm x 66 cm
Weight	134 to 244 lbs / 61 to 110 kg
Mounting	23" rack mount
Rated net power	0 to 2,000 Watts
Performance	
Rated current	0 to 80A @ 24VDC / 0 to 40A @ 48VDC
DC voltage	24 or 48 VDC nominal
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	3.5 to 6 psig / 24 to 41 KPag 0.24 bar to 0.41 bar
Fuel	
Hydrogen Storage Capacity	n/a
Operation	
Ambient temperature	35°F to 115°F / 2°C to 46°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Indoors
Emissions	
Water	Max. 30mL / kWh
Noise	53 dBA @ 3.28 ft / 1 meter
Monitoring / Control	
Remote	System configuration & status / Historical & operational data
Communications	RJ45 / DB9 / Dry Contact



T-2000® 4kW in Enclosure

Dimensions (w x d x h)	54" x 41" x 72" 137cm x 104cm x 183cm
Weight	1004 lbs / 456 kg*
Rated net power	0 to 4,000 Watts
Rated current	0 to 160A @ 24VDC / 0 to 80A @ 48VDC
DC voltage	24 or 48 VDC nominal
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	3.5 to 6 psig / 24 to 41 KPag 0.24 bar to 0.41 bar

Modular solutions scalable from 48 to 96 kWh

Ambient temperature	-40°F to 115°F / -40°C to 46°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Outdoors



T-2000® 6kW in Enclosure

Dimensions (w x d x h)	54" x 41" x 92" 137cm x 104cm x 233.7cm
Weight	1293 lbs / 586 kg*
Rated net power	0 to 6,000 Watts
Rated current	0 to 240A @ 24 VDC / 0 to 120A @ 48VDC
DC voltage	24 or 48 VDC nominal
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	3.5 to 6 psig / 24 to 41 KPag 0.24 bar to 0.41 bar

Modular solutions scalable from 48 to 96 kWh

Ambient temperature	-40°F to 115°F / -40°C to 46°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Outdoors



T-1000® 1 Meter Enclosure

Physical	
Dimensions (w x d x h)	29" x 26" x 39.4" 73.7cm x 66cm x 100cm
Weight	185 lbs / 84 kg*
Mounting	
Rated net power	0 to 1,200 Watts
Performance	
Rated current	0 to 50A @ 24VDC / 0 to 25A @ 48VDC
DC voltage	24 or 48 VDC nominal
Fuel	
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	3.5 to 6 psig / 24 to 41 KPag 0.24 bar to 0.41 bar
Hydrogen Storage Capacity	Modular solutions scalable from 8 kWh
Operation	
Ambient temperature	-40°F to 115°F / -40°C to 46°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Outdoors



T-1000® Extended Run

Dimensions (w x d x h)	43" x 35" x 72" 109cm x 89cm x 183cm
Weight	470 lbs / 212 kg*
Rated net power	0 to 1,200 Watts
Rated current	0 to 50A @ 24VDC / 0 to 25A @ 48VDC
DC voltage	24 or 48 VDC nominal
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	3.5 to 6 psig / 24 to 41 KPag 0.24 bar to 0.41 bar
Hydrogen Storage Capacity	Modular solutions scalable from 48 to 96 kWh

Ambient temperature	-40°F to 115°F / -40°C to 46°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Outdoors

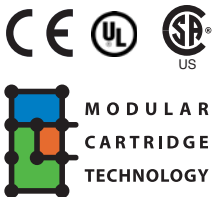


T-2000® 8kW in Enclosure

Dimensions (w x d x h)	53.5" x 41" x 72" (per 4kW) 136cm x 104cm x 183cm
Weight	1004 lbs / 452 kg* (per 4kW)
Rated net power	0 to 8,000 Watts
Rated current	0 to 320A @ 24VDC / 0 to 160A @ 48VDC
DC voltage	24 or 48 VDC nominal
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	3.5 to 6 psig / 24 to 41 KPag 0.24 bar to 0.41 bar
Hydrogen Storage Capacity	Modular solutions scalable from 48 to 96 kWh

Ambient temperature	-40°F to 115°F / -40°C to 46°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Outdoors

* weight references fully equipped solutions, without hydrogen cylinders



NEBS Level 3

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6,218,035; 6,387,556; 6,428,918; 6,468,682; 6,773,839
and other patents pending. Product specifications
are subject to change at any time.

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