



Utility communications networks provide the backbone for SCADA and EMS and are mandatory for safe and effective protection and control of the power grid. Remote terminal units communicating vital information to System Operators and the growing reliance on SCADA dictates that remote stations be hardened against natural and man-made disasters. ReliOn fuel cell products offer a proven solution to harden critical networks against service-impacting issues.



Reli|On
+ | -[®]

Your Sites

The electrical power grid is the lifeblood of a society. It powers critical systems including wireline and wireless telecommunications, E-911 services, radio and repeater sites, hospitals, schools and site security/video surveillance systems. Extreme weather, human error, and sabotage all pose threats to stable grid service. The Northeast power outage in August of 2003 was painful proof that individual substations cannot rely solely on redundant station service transformers for substation battery charging. After a systemwide power disruption, the grid must be restored both quickly and safely, requiring that substation batteries be in prime condition and that remote terminal units are ready to send and receive telemetry. System restoration after the 2003 outage was exceedingly slow and could have been expedited had the individual substations had batteries with ample charge.

Regional and seasonal threats to grid power vary, from hurricanes to tornadoes, ice storms to thunderstorms, but the number of events is not decreasing. In 2006, according to data provided by the DOE's Energy Information Administration, these major disturbances caused over 200 days of lost grid power around 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.

In these situations, backup power becomes key. Reliable backup power for protection & control, SCADA communications and site monitoring is crucial and results in favorable SAIDI and CAIDI statistics and improved customer satisfaction. Redundancy is required to supply consistent power, ensuring an absolute minimum of downtime and stable services by improving reliability and availability. Fuel scarcity in times of disaster can threaten the fuel supply for backup generators, and in some regions, generators themselves become threatened with theft. Additionally, environmental issues can come into play - noise and air pollution requirements and spill containment issues can make it difficult to get permitting for some sites.

At ReliOn, we understand the headaches - 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 large and small operators in the United States and in many other world locations - through hurricanes, snowstorms and extreme cold. In applications needing hundreds of Watts as well as those needing several kilowatts - for sites needing hours of backup power and those needing days.

	RTU	Radio/Repeater Sites	Substation Protection & Control	Video Surveillance	Microwave Communications
< 1kW	●	●	●	●	●
2kW		●	●	●	
4kW		●	●		
6kW+			●		

power cartridges or electronic cards, system operators are able to leverage initial investments in fuel cell backup systems, balancing capex and opex. Modular architecture also means less maintenance and easier, quicker repairs for our fuel cells. This means your staff spend less time at your sites.

High Reliability & Availability

ReliOn's fuel cells are field proven through extreme weather conditions in customer locations. The fuel, industrial-grade hydrogen, is available through local industrial gas suppliers. Because hydrogen is not widely used, there is little competition for supply during large outages. The fuel cell solution, whether installed indoors or in outdoor enclosures gives no indication that it is a generator, resulting in significantly lower theft. When added to an existing backup solution, ReliOn's fuel cells add another layer of site hardening. In a Greenfield site, they offer high reliability at a lifecycle cost comparative to incumbent technologies.

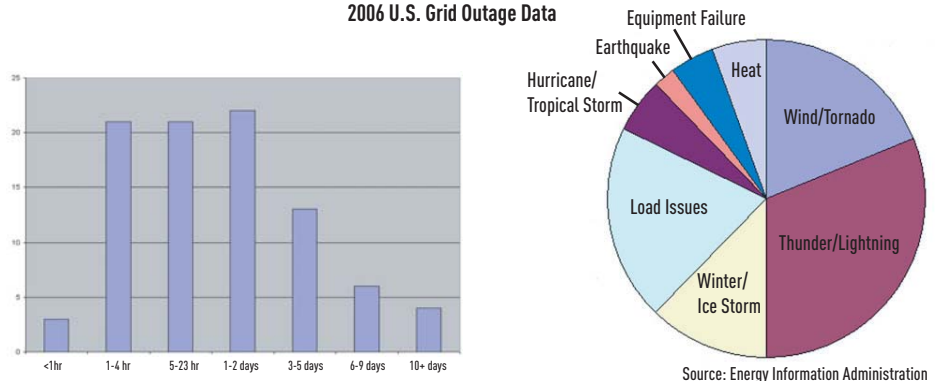
Capacity & Scalability

ReliOn's fuel cell systems can be installed in a wide variety of configurations, both indoor in standard racks, and in outdoor enclosures. Single systems can be partially populated with power cartridges and electronic cards to meet smaller demands. Multiple units can be tied together to achieve higher capacities. As your needs change, ReliOn's system can adapt as fast as your power demands require, protecting your investment going forward.

Siting and End-Of-Life Management

Environmental issues are in the forefront of people's minds. Sensitive areas where noise, emissions, and fuel containment can be problematic create installation challenges. ReliOn fuel cell systems are quiet, emit no pollutants, have no spillage issues when fueled with bottled hydrogen, and the majority of components can be recovered at the end of operating life, making ReliOn fuel cells easier on the environment than incumbent solutions.

2006 U.S. Grid Outage Data



Source: Energy Information Administration

Our Solutions

ReliOn fuel cell systems have revolutionized the application of reliable backup power for critical telecommunications sites, substation control houses and locations equipped with remote terminal units. ReliOn's T-1000® and T-2000™ systems provide several advantages over traditional backup power methodologies - batteries and internal combustion generators. Like batteries, fuel cells provide current directly to the DC bus, 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 from 24 to 48 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 under 600 Watts to 12,000 Watts.
- 8 to 96 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.

Tax Credits Availability

- Federal tax credits through 2005 Energy Bill.
- \$1,000 per kilowatt or 30% of system cost, whichever is less.
- Additional incentives available in some States make value proposition very attractive.

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.

	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	77 to 239 lbs / 35 to 108 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" (footprint) 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
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™ 6kW in Enclosure

Dimensions (w x d x h)	54" x 41" x 92" (footprint) 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 W 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-1000® Rack Mount

Physical	
Dimensions (w x d x h)	14" x 21.5" x 26" (in rack) 35.6cm x 54.6cm x 66cm
Weight	96 to 162 lbs / 44 to 74 kg*
Mounting	
Rated net power	0 to 1,200 Watts
Performance	
Rated current	0 to 50A @ 24 VDC / 0 to 25A W 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 48 to 96 kWh
Operation	
Ambient temperature	32°F to 115°F / 0°C to 46°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Indoors



T-1000® Extended Run

Dimensions (w x d x h)	43" x 35" x 72" (footprint) 109cm x 89cm x 183cm
Weight	455 lbs / 206 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)	82" x 41" x 72" (footprint) 208cm x 104cm x 183cm
Weight	1841 lbs / 835 kg*
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



© 2007 ReliOn, Inc. All rights reserved.
Protected by U.S. Patent Nos. 6,030,718; 6,096,449;
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.

Contact Us

15913 E. Euclid Ave.
Spokane, WA 99216
Tel: 1-509-228-6500
Toll Free (U.S.): 1-877-474-1993
Fax: 1-509-228-6510
www.relion-inc.com

