

Hydrogen Fuel Cells - Wireless Applications



Reli On
+ -[®]

The emergence of wireless telecommunications as a primary means of communication among the general population and the rollout of 3G/4G network technologies has mandated that network reliability become a top priority. The ability for wireless networks to remain operational in adverse conditions is absolutely critical, impacting life safety E-911 services, revenue and long term customer satisfaction and retention. ReliOn fuel cell products offer a key solution to wireless companies actively pursuing initiatives to harden the network against service impacting issues.

Fuel Cells

Simply Powerful

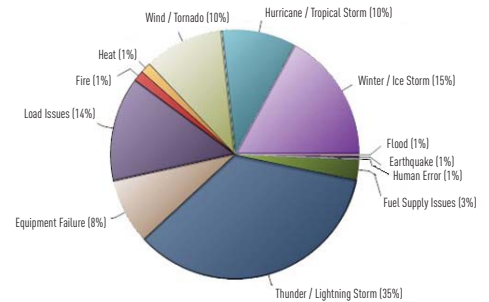
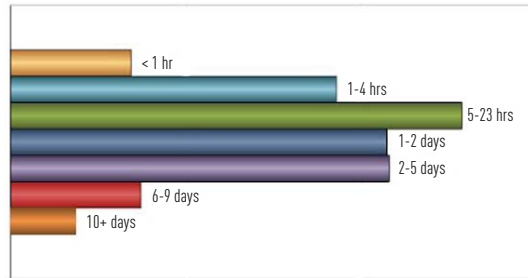
your sites

The wireless industry faces many challenges today. Billion dollar networks go down due to annual weather events, human factors or natural disasters. Stable service is a necessity for any wireless provider seeking to grow market share and minimize customer churn. Power is a big issue and uptime is critical. Revenue, customer retention, emergency communications – what it comes down to is that you’ve got to keep the network up.

Maintaining a robust network is a challenge for all service providers. Customers demand quality-of-service, high reliability and 24/7 availability, particularly in severe conditions when the ability to communicate becomes critical. Regional and seasonal threats to grid power vary, from hurricanes to tornadoes, winter storms to thunderstorms.

According to an average of the 2005 through 2011 data provided by the Department of Energy’s Energy Information Administration, these major disturbances typically last between one hour and five days. This does not include the day-to-day disturbances we all experience from time to time. The need for “always on” service remains.

2005-2011 Average U.S. Grid Outage Data



In these situations, backup power becomes key – and having options is important. Redundancy is required to supply consistent power, ensuring an absolute minimum of downtime 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, policy around noise and air pollution and spill containment issues can make it difficult to provide power for some sites.

At ReliOn, we understand the headaches - with over 125 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 as little as 50 Watts as well as those needing several kilowatts – for sites needing hours of backup power and those needing days or weeks.

	Cellular/PCS GSM/CDMA/BTS sites	Wireless Broadband BWA, WiMAX, Mesh	Wireless Backhaul Microwave/T1/ Fiber
< 1kW		●	●
2kW	●	●	●
4kW	●	●	
6kW+	●		

ReliOn’s forward-thinking design provides a fuel cell power solution that gives you the ability to grow as power requirements increase. Modular, scalable architecture 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. With power representing up to 10% of the cost of operations at a typical cell site in mature markets (source: Nokia Siemens Networks, November 2009), backing up that power needs to be as cost effective as possible.

High Reliability & Availability

ReliOn’s fuel cells are field proven through extreme weather conditions in geographically diverse customer locations. 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 savings eclipsing that of incumbent technologies. 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 hardened outdoor enclosures, gives no indication that it is a generator, resulting in significantly lower theft.

Capacity & Scalability

Product scalability allows ReliOn systems to meet your actual power requirements, whether smaller or larger capacity is needed. Fuel cell systems are load-following, giving only the amount of power needed by site equipment. As your needs change, ReliOn systems adapt as quickly as your power demands require, protecting your investment.

Siting and End-Of-Life Management

Environmental issues are in the forefront of many 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. The majority of components can be recovered at the end of operating life, making ReliOn fuel cells easier on the environment than incumbent solutions.

our solutions

ReliOn fuel cell systems have revolutionized the application of reliable backup power for critical equipment. ReliOn's E-series and T-series products provide several advantages over traditional backup power methodologies - batteries and internal combustion generators - as the sole power solutions. Like batteries, fuel cells provide current directly to the DC bus, but have a significantly increased service life and decreased maintenance costs, as well as a smaller footprint for longer runtimes. Installation is accomplished with ease. Additionally, fuel cell runtime, as with a generator, is a function of fuel storage, but with few moving parts and lower maintenance.

Reliable

- Advanced design enables specialized management of fuel cell membranes, which leads to increased reliability of the system.
- N+1 or 1+1 redundancy is designed into the system.

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.
- ReliOn's E-series offers a modular, fault-tolerant design, ensuring continued power to customer equipment, using larger power module building blocks. Multiple bus and multiple voltage scenarios are easy to accommodate.

Scalable

- ReliOn products allow the customer to configure the product to suit the load.
- From under 100 Watts to 20,000 Watts.
- Scalable hydrogen storage provides for up to hundreds of hours of runtime easily.

Low Maintenance

- Annual air filter inspection.
- Refueling as needed - hours to weeks of runtime between refueling cycles.
- Mean time to repair - minutes.
- Advanced diagnostics and self-testing

Environmentally friendly

- Hydrogen in, power and warm water out.
- No emissions
- Low noise signatures under 60 dBA @ 5 feet.

U.S. Tax Credit Availability

- Federal tax credits available for systems above 500W.
- \$3,000 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 50°C / -40°F to 122°F.
- Field-proven ability to perform during hurricanes, ice storms and other harsh weather.
- Diverse geographic locations.

Monitoring and Control

- Remote / local system configuration and status monitoring for historical and operational data.

Hybrid configurations

- Whether off-grid or on, ReliOn fuel cells work well in hybrid solutions with solar and wind power for a complete clean energy solution.

* ReliOn's T-1000 and T-2000 fuel cell systems offer hot-swappable maintenance.

	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



E-2500™ Rack Mount

Physical	
Dimensions (w x d x h)	21.25" x 24" x 14" (in rack) 54.7cm x 61cm x 35.6cm
Weight	113 lbs / 51.4 kg*
Mounting	23" rack mount (8U)
Rated net power	0 to 2,500 Watts
Performance	
Rated current	0 to 105A @ 24 VDC / 0 to 52.5A @ 48VDC
DC voltage	24 or 48 VDC nominal
Fuel	
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	8 to 12 psig / 55.1 to 82.8 KPag / 0.55 to 0.83 bar operating
Hydrogen Storage Capacity	Modular solutions scalable from 8 kWh to 300 kWh
Operation	
Ambient temperature	23°F to 122°F / -5°C to 50°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Indoors or hardened outdoor cabinet



E-2500™ 10kW 32U23 with HSM

Dimensions (w x d x h)	53.75" x 49.8" x 72"	52" x 56" x 72"
	136cm x 126.5cm x 183cm	132cm x 142cm x 183cm
	1100 lbs / 500 kg*	6,300 lbs / 2864 kg
Rated net power	0 to 10,000 Watts	
Rated current	0 to 416A @ 24 VDC / 0 to 208A @ 48VDC	
DC voltage	24 or 48 VDC nominal	
Fuel		
Composition	Standard industrial grade hydrogen (99.95%)	
Supply pressure to unit	8 to 12 psig / 55.1 to 82.8 KPag / 0.55 to 0.83 bar operating	
Hydrogen Storage Capacity	Modular solutions scalable from 8 kWh to 300 kWh	
Operation		
Ambient temperature	-40°F to 122°F / -40°C to 50°C	
Relative humidity	0-95% non-condensing	
Altitude	-197 ft to 13,800 ft / -60m to 4,206m	
Location	Outdoors	



E-1100™ Rack Mount

Dimensions (w x d x h)	17.25" x 24" x 7"
	43.8cm x 61cm x 18cm
	58 lbs / 26.4 kg*
Mounting	19" or 23" rack mount
Rated net power	0 to 1,100 Watts
Rated current	0 to 46A @ 24 VDC / 0 to 23A @ 48VDC
DC voltage	24 or 48 VDC nominal
Fuel	
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	8 to 12 psig / 55.1 to 82.8 KPag / 0.55 to 0.83 bar operating
Hydrogen Storage Capacity	Modular solutions scalable from 8 kWh to 300 kWh
Operation	
Ambient temperature	23°F to 122°F / -5°C to 50°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Indoors or hardened outdoor cabinet



E-1100™ 16U23 Cabinet with 6Cyl300 Fuel Storage

Physical	
Dimensions (w x d x h)	54.5" x 45.5" x 72"
	138.4cm x 115.6cm x 183cm
Weight	900 lbs / 408 kg*
Mounting	
Performance	
Rated net power	0 to 1,100 Watts per chassis
Rated current	0 to 46A @ 24 VDC / 0 to 23A @ 48VDC
DC voltage	24 or 48 VDC nominal
Fuel	
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	8 to 12 psig / 55.1 to 82.8 KPag / 0.55 to 0.83 bar operating
Hydrogen Storage Capacity	Modular solutions scalable from 8 kWh to 300 kWh
Operation	
Ambient temperature	-40°F to 122°F / -40°C to 50°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Outdoors



E-1100v™ 16U20v Cabinet with 6Cyl300 Fuel Storage

Dimensions (w x d x h)	41.3" x 72" x 34.3"
	105cm x 183cm x 87.1cm
	478 lbs / 216.8 kg
Mounting	23" rack mount/cabinet/wall
Performance	
Rated net power	0 to 1,100 Watts
Rated current	0 to 46A @ 24VDC / 0 to 23A @ 48VDC
DC voltage	24 or 48 VDC nominal
Fuel	
Composition	Standard industrial grade hydrogen (99.95%)
Supply pressure to unit	8 to 12 psig / 55.1 to 82.8 KPag / 0.55 to 0.83 bar operating
Hydrogen Storage Capacity	Modular solutions scalable from 8 kWh to 300 kWh
Operation	
Ambient temperature	23°F to 122°F / -5°C to 50°C
Relative humidity	0-95% non-condensing
Altitude	-197 ft to 13,800 ft / -60m to 4,206m
Location	Outdoors



T-2000® 4kW in Enclosure with 6Cyl300 Fuel Storage

Dimensions (w x d x h)	54" x 41" x 72"
	137cm x 104cm x 183cm
	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
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 2.5 kWh to 300 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

Reli On

FUEL CELLS
SIMPLY POWERFUL

BPS™

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* weight references fully equipped solutions, without hydrogen cylinders