Power Innovations

POWERING LIFE

MAJOR BLACKOUTS—REALITY

A September 2003 blackout in Italy affected most of the country's 58 million people. In August 2003 a major power outage paralyzed the northeastern United States and southeastern Canada, shutting down subways, closing offices, damaging business, and disrupting lives.

An Auckland, New Zealand, power outage in 1998 left the core of this major city without power for 52 days. A massive power outage in 1996 affected nine states in the West. A major 1977 blackout in New York City spurred widespread rioting. In 1965, the Great Northeast Blackout left 30 million people in the northeastern United States and Canada in the dark.

Isolated incidents? Not according to the U.S. Department of Energy, whose records show a major U.S. outage every 16 days during 2002, stranding a total of 218,463 people and lasting a net 63 hours before power was restored.

Demand for power has been increasing steadily, and supply is insufficient to meet even existing demand. The outdated distribution network (power grid) has ushered in an era of contaminated and unstable power. Even after it reaches its destination, power quality is impacted by building wiring, noise from equipment in the area, and other factors.

Power Innovations generates, stores, and manages clean, reliable power.

Power Innovations delivers the highest quality uninterruptible power for homes, businesses, and governments worldwide. In fact, the company has set a new industry standard for uninterruptible power quality.

Through its Uninterruptible Power Quality (UPQ™) solutions, Power Innovations enables on-site and remote management and control of power, and provides back-up power in the event of power failure. In addition, the company has the ability to adapt any piece of equipment to global power standards and to monitor environmental concerns. Power Innovations provides the best power solutions in the industry.

According to a study conducted by Business Communications Company, "It is no longer possible to ignore the implications of the reliability and overall quality of our electrical power supply. Without dramatic changes in the quality of electric power coming into homes and businesses, everyone on the grid, from residential to industrial customers, is vulnerable to significant damage and loss. Interruptions and disturbances in supply voltage can shut down, damage, or even destroy the equipment it is attempting to run."

Whether exploring for oil in the Gulf of Mexico, protecting the world's airports, monitoring traffic, performing surgery, transmitting data, or hosting the largest public event in history, power—good clean, dependable power—is a basic necessity. Power Innovations makes that necessity, reality!

For times when power quality cannot be compromised, data and operations are crucial, and any amount of downtime is unacceptable, Power Innovations provides the solutions for powering life–today and tomorrow.

Powering Miracles

For newborn babies, every breath is precious. Making the transition from a mother's womb into the world requires a carefully regulated environment for the at-risk newborn. During the first few days, every minute of the infant's new life increases its chances of survival.

Like many babies, Sammie's first few hours were critical. On delivery, Sammie was placed in a controlled environment and put on a rapid-breathing machine to help him breathe at a normal rate. In his regulated surroundings, Sammie adjusted quite nicely—until the power went out, that is.

When hospital equipment shut down—and generator power failed—Sammie's life was in danger. Nurses and doctors in the hospital's nursery began respirating Sammie, as well as other infants who had been placed on rapid-breathing machines, with hand bags. For nearly 30 minutes, hospital staff worked tirelessly to keep Sammie and the other infants alive until the power was restored.

True story? Yes! That is why makers of life-saving medical equipment are making changes.

Hill-Rom supplies healthcare facilities worldwide with solutions that help caregivers deliver the most effective and efficient care to their patients. "Hospitals can't afford to lose power," says Dave Eustice, Hill-Rom's Marketing Manager for New Product Development. "Also, the quality of power in hospitals is universally very poor. I have seen many inconsistencies in the quality of power that is supplied to our medical devices."

Being able to protect life requires a consistent supply of good power. Protecting life requires medical devices that do not fail when the power is disconnected or power fluctuations occur when a generator turns on. It requires the protection of a UPQ.

After a baby is born, infants are assessed for breathing, responsiveness, and coloring. After this evaluation, the baby is transported from a labor-and-delivery unit to somewhere else in the hospital, traditionally a neonatal or intensive-care unit if a baby needs additional help.

But how is an at-risk baby's environment continuously regulated when the power from an open-care bed or incubator is disconnected and the baby is transported from one area of the hospital to another?

"The traditional way of moving an infant from one hospital wing to another is with a transport incubator," explains Eustice. "Essentially three units are dirtied in order to accomplish one task; otherwise, the infant's life is compromised. Clearly it is best to unplug one unit and move the infant from department to department while still having the capability of monitoring and regulating the environment—even when it's not connected to utility power. Building UPQ systems into our hospital equipment maximizes patient mobility with the use of only one piece of equipment."

Caregivers in any hospital, long-term care, acute care or home care environment are equipped with medical devices to treat patients with complex illnesses and injuries. Making a difference in the lives of caregivers and their patients requires more than good medical devices—it requires the power to keep medical devices operating correctly when they are exposed to unclean power. Power Innovations' UPQ systems are imperative to meet this need.

Health Care

STEVEN MACARTHUR, M.D.
MEDICAL EXPERT

As Chief of Staff at Ririe Hospital in Ely, Nevada, Steven MacArthur, M.D. depends on power to perform daily miracles. Located at least 135 miles from the nearest major city, patients under MacArthur's care rely on power for medical treatment and diagnoses.

"In a hospital we depend upon a stable power supply for almost everything we do." Without power, MacArthur says patient survival would decrease and quality of treatment would be compromised. "For those of us practicing medicine in remote areas, power is even more critical than people realize. In Ely we don't have a radiologist, and we use the Internet to send all of our X-rays to Reno. When a stroke patient comes into the emergency room, a CAT scan is immediately taken. From the onset of the stroke, doctors have about two hours to send the CAT scan to another hospital and find out if the stroke has been caused by bleeding or lack of blood to part of the brain. If power problems cause the Internet to go down, we are back to practicing 1850's medicine. We simply can't have that happen."

DAN ERICKSON
SECURITY EXPERT

Dan L. Erickson, Vice President and Chief Technology Officer of General Communications, knows what it takes to keep a facility safe and secure.

As a system integrator for governments and businesses, Erickson is emphatic about encouraging customers to have the proper power conditioning throughout their facilities, especially on sensitive security equipment such as audio, video, and data recorders. “I would say 100% of our clients need power conditioning and backup. Now do 100% of our clients get it? No, and that is very unfortunate. I would like to see all of our clients give higher priority to their power conditioning and reliability issues. Audio-video systems are very susceptible to power spikes, and there have been too many instances where these systems have been blown out by improperly conditioned power within a facility.”

Security

Powering Peace of Mind

Since one of the largest terrorist attacks in history, security measures globally have increased. Airports are more vigilant, communities are more cautious, and law enforcement is doing all it can to give residents peace of mind.

For many business and government entities worldwide, security has always been a top priority. Protecting data, technology, property, and personnel is taken very seriously. Many organizations have centralized security command and control centers to track any and all suspicious movement that takes place in or outside their facilities. Surveillance cameras hover around doorways and patrol the halls. Electronic locks bolt the doors, and personalized access cards permit entry into select portions of buildings.

Without adequate power protection in place, however, Dave Rossiter, CEO of Utah Controls, Inc., states that preventing a security breach is impossible. "Imagine chasing a ghost when there is a real emergency. Any power problem—like a transient, noise, spike, fluctuation, or loss—can cause head-end security equipment to malfunction and give invalid reads."

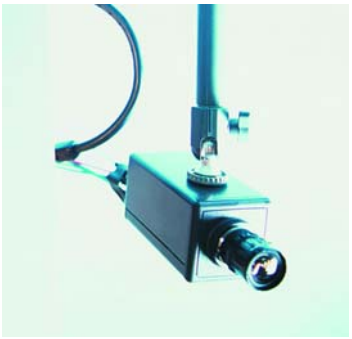
"At one point, before we began connecting security equipment to power-conditioning devices, a power spike shot through the security's main computer system at one of our client facilities. At the time, the control area was vacant. For some reason, the computer pulled a man's name out of the database and showed him entering—or trying to enter—different areas of the building he wasn't authorized to access. The employee just about lost his job over it."

Fortunately, because of TV cameras that monitored the doorways, the man was eventually able to reclaim his innocence. But, as Rossiter explains, not even surveillance equipment is safe from power glitches. "With bad power you can get a blinking or rolling of the cameras. It's kind of like the fuzzy display you have seen on a television—if you have ever had the experience of turning it on while the microwave or vacuum cleaner is running."

Power problems are not always caused from within a facility; they can be felt from many blocks down the street. Harmonic generating devices are everywhere, and the overburdening of utilities is a growing cause of numerous power quality problems.

For Utah Controls, installing security equipment worth well over a million dollars is not abnormal. "In the past, power spikes alone have corrupted files and software, and have damaged head-end computers. These types of problems are all quite costly to repair." Being able to provide a power backup and a power quality solution that will completely isolate the power used by security equipment is why Rossiter chose Power Innovations.

Security measures are implemented in airports to give travelers peace of mind, but putting such measures in place can delay a traveler's trip—especially if power causes security equipment to operate erratically. Attaching Power Innovations' UPQ systems to airport security equipment in Canadian and American airports gives security equipment the reliable power it needs to ensure passenger security and avoid unnecessary delays.



Powering Life's Connections

The C-17 aircraft is equipped to transport humanitarian aid, military equipment, and troops anywhere in the world. Involved in numerous contingency operations worldwide, the airlifter has played a key role in Operation Joint Endeavor to support peacekeeping efforts in Bosnia, Allied Force Operation in Kosovo, Operation Enduring Freedom in Afghanistan, and Operation Iraqi Freedom. Pilots who train to fly this aircraft must have the skills to precisely and safely carry out missions worldwide.

With the use of flight simulators, pilots gain and sharpen the skills necessary to properly operate this large and highly technical airlifter. "When pilots step into a simulator, they need to think they are in a real aircraft," says Bert Sawyer, Program Manager for FlightSafety's C-17 program. "A C-17 simulator is so close to being equivalent to the actual aircraft that it even gets certified to the same requirements."

Since the development of the airplane, FlightSafety has developed flight simulators to stay current with the aircraft upgrades. "We play a pretty important role in pilot training," Sawyer touts. When hostile forces over Baghdad International Airport attacked a five-member C-17 crew, landing practice proved particularly useful. When an engine exploded shortly after take-off, the crew was able to take the airplane safely back to the Baghdad airport. Because pilots regularly practice landing the aircraft without an engine, crew members said that operating the plane was no different than operating a simulator.

For effective flight simulator training, clean power makes all the difference. With poor facility wiring and unconditioned power, Sawyer has witnessed anomalies in the simulator's operation. "Gauges will not work right. Data transfers between high-speed interfaces will not always function correctly. The pilot will see fuzzy lines in the visual system, and the display will jump and flicker. Pilots can even get little bumps or vibrations in the control loading system (a mechanism the pilot flies with) or the motion system (a device that moves the simulator around). None of that happens in the real aircraft."

When FlightSafety placed these high-tech pieces of equipment into its facilities, Sawyer recalls too many instances when the power knocked simulators off line and caused problems. "We have installed our equipment into some rough areas. Probably the worst scenario I have seen was when we installed a simulator in Taiwan. The power coming into the facility was just poor; it was dirty power, and they constantly had brownouts. Using Power Innovations technology resolved our issues."

In the United States Air Force, thousands of satellite communications are sent and received each day. A fighter pilot receives target coordinates. A missileer gets urgent orders. Precision-guided weapons are launched. And a signal from behind enemy lines reaches a computer thousands of miles away in a matter of moments. Connectivity with pin-point accuracy and split-second timing depends on clean, reliable power from Power Innovations.

Connectivity

DOUGLAS CHABRIES
CONNECTIVITY EXPERT

Douglas Chabries knows power. Dean of the College of Engineering and Technology at Brigham Young University, Chabries has advanced degrees from Brown, Cal Tech, and the University of Utah.

For Chabries, keeping a large university campus connected 24-7 is no small task. “Every time we experience a lightning storm, we see power surges and dropouts. Little anomalies cause damage to mission-critical systems. One little power glitch that causes an alarm not to sound can put students in jeopardy. The key is to understand your systems, understand your environment, and have the proper tools to defend your equipment.”

Large Events

ED GREENE
EVENT EXPERT

Power is critical to Ed Greene's business. Greene is an independent audio engineer who works on sound for live events such as the Salt Lake Olympics, the Oscars, and PBS Capitol Concerts..

"While producing high-quality audio sound for large audiences, we have to have a reliable, uninterruptible power source—so if the rest of the world loses power, we won't." For Greene, conditioning the power is just as important as not losing power. "Dirty power is a huge problem—more important than people realize," Greene emphatically declares. "The audience may not realize we have dirty power; but they will hear the hums, buzzes, and noise distortions. For me to do my job I need clean power."

Greene received his 16th Emmy in September 2002—this time for Outstanding Sound Mixing for a Variety or Music Series or Special at the Salt Lake City Olympic Opening Ceremony.
During the event, Greene protected his equipment, and the sound he was producing, with Power Innovations' UPQ systems.

Powering the Human Spirit

The Salt Lake City Olympics involved millions of spectators, 100,000 participants, staff, and volunteers, as well as media from all 77 participating nations. Infrastructure included 32,000 miles of optic fiber cable, thousands of computers, hundreds of scoreboards, and enough power-hungry equipment to bring a large city to its knees.

For the organizers behind the Salt Lake City 2002 Winter Olympic Games, losing power—even on a small scale—was unimaginable. "Power was a major concern," says Lane Beattie, Utah State Olympic Officer. "So much depended on power. It was one of those key areas that was vital to our success."

With memories of the 9/11 attack still fresh, the event was secured by a dizzying array of sensors, cameras, and security paraphernalia. A loss of power could shut down this critical equipment. Beattie says the Olympic plan, which later became the model for Homeland Security, placed a high priority on clean, available power. "We simply couldn't afford to lose equipment power anywhere without a seamless interface to back-up power."

Security was just the tip of the iceberg, however. "When you go behind the scenes at an event the size of the Olympics, you quickly realize how much is at stake," says Beattie. "If there had been a problem that shut down the media, we would have embarrassed our community forever."

In addition to security, "We were the first Olympics to sell tickets over the Internet," reports Beattie. "We broke all existing records for ticket sales, selling 1.9 million. We also coordinated tens of thousands of volunteers through our site and provided information to the public." Beattie quickly adds, "An interruption of power could have crippled our Internet presence, which would have severely hampered our ability to run the Games."

Of course, no system is perfect; and it stands to reason that there were power failures during the Games. "There were a number of times when something went down here or there; but the public was not aware of it because our UPQ systems automatically took over and kept the events running," says Beattie. "At one point we had a snowmobile take out power at a major event. The backup power kept us running and nobody was inconvenienced. Most of the crowd was unaware of the incident."

Now that Beattie has time to reflect on the success of the Games and look forward to future Games, he adds, "It is nice to stand on this side of success. We had an advantage because Salt Lake City is a large city. Many Olympic host cities are isolated and just don't have as much mainline serviceable power as we did. For them, guaranteeing clean, available power is an even bigger challenge."

At a time when everything had to be perfect, Power Innovations provided absolutely failsafe power to manage and control as many as 500 systems at Olympic venues for the Salt Lake 2002 Olympic Winter Games.

Powering Freedom

Located in the heart of Salt Lake City is the most advanced state-of-the-art traffic monitoring and control facility in the country. From one centralized location, the Utah Department of Transportation (UDOT) monitors roads, freeways, and critical intersections throughout the state. When accidents occur, emergency crews are immediately dispatched to the areas indicated on the screens.

But what happens if power is lost or compromised?

"When there are power problems in the control facility, we don't have monitoring capabilities," explains Jim Kammeyer, Automated Traffic Management Systems and Freeway Lighting Maintenance Supervisor for UDOT.

In the event of a power failure, UDOT's Traffic Control Center has traditionally been protected by generators. "A couple of times, the power just kicked off due to lightning storms that rolled through the area. Our feed went down and the generator didn't start up. In one case, the facility was without power for about 20 minutes, meaning that there were no monitoring capabilities for an entire 20 minutes. So far, we've just been lucky that no emergency situations happened during those times. We are trying to resolve the problem."

The Department of Transportation relies on perfect, dependable power not only for operating its control facility, but also for advising drivers of road conditions. "If we spot a problem, we need to advise the public," Kammeyer says.

Traveling on many of Utah's narrow canyon roads can be extremely hazardous when they are slick or packed with snow. "Electronic road signs advise travelers of mountain road conditions or crashes and suggest alternate routes. We have these advisories in place to protect Utah drivers."

Wild voltage fluctuations caused by heavy equipment at industrial sites can also impact power supplied to traffic systems. "We have actually seen the voltage drop from 120 volts to below 90 volts. Without a UPQ system to regulate, clean, and condition the power, traffic systems will not function properly."

When traffic signals fail, intersections should be treated as four-way stops, but Kammeyer tells what really happens when stop lights don't have power. "Even though the public is supposed to treat the intersection as a four-way stop, there are always some who will not abide by the rules. Their negligence causes traffic accidents. To protect the public and to prevent accidents, UPQ systems keep traffic signals operating. They are critical for public safety on the roads."

Electronic billboards, typically used to warn people of severe weather, have also been the means of finding over 100 kidnapped children. Because 74 percent of children abducted by strangers are killed within three hours of being taken, the AMBER Alert, broadcast on radio and television and displayed on electronic highway signs, gives kids an extra chance for survival. "An AMBER Alert can only be successful through the cooperation and coordination among law enforcement, transportation officials, broadcasters, and the vigilant public—all working together to find abducted children," said Deborah J. Daniels, Assistant Attorney General for the Office of Justice Programs and the National AMBER Alert Coordinator. Without stable power connected to electronic traffic signs, the alert is futile.

To prevent traffic delays, the Texas Department of Transportation uses Power Innovations' solutions to prevent power surges and brownouts from resetting traffic signals and jamming traffic. Traffic signals, as well as cameras located on top of the signals, receive the quality power they need to keep transportation systems running smoothly.

Transportation

As project leader for Pathfinder Energy Services, a leading directional-drilling service provider, Mark Beattie needs a stable supply of power that will keep him operational offshore or in remote land locations.

MARK BEATTIE
EXPLORATION EXPERT

"We typically run 24 hours a day acquiring information below the earth's surface. If we have a power fluctuation that even intermittently shuts down a computer system, it upsets the operations because we stop getting the real-time information we need to steer drill bits in the proper direction."

Beattie adds, "Because we work in a dusty and dirty environment, our equipment takes a lot of abuse. Having Power Innovations' small, rugged units to take care of our power needs is imperative."

Exploration

Powering Innovation

Baker Hughes and its subsidiaries supply oil and gas producers with the technology to find, develop, produce, and manage petroleum reservoirs in some of the most rugged terrain and environmental conditions known to man.

For Doug Young, Senior Technical Support Engineer at Baker Hughes Atlas, power cannot be an issue. Working under the scorching desert sun, amidst snow-capped glacier mountains, or even offshore in the middle of the Atlantic Ocean, Young never knows what kind of power will be available. "Rig or generator power is not the nicest, cleanest source of power. While hooked up to rig power, we have actually watched the lights dim while we were logging data. Now it is standard practice to take our own power source to each drilling site. But some areas of the world won't even allow us to do that. In those circumstances we must adapt to whatever rig power is available at the site."

Without a dependable power source, accurate data cannot be retrieved. "If a backup generator goes out or a power surge occurs, millions of dollars' worth of customer data can be lost," Young says. "The operational costs of some of our rig times can be $50,000 to $60,000 an hour. If we have spent 24 hours of a customer's time logging data, the impact of its loss is astronomical."

As a leader in oilfield services, Baker Hughes Atlas explores and evaluates reservoirs of oil wells, open holes, and cased holes in some of the most remote areas of the earth. "We have very sophisticated sensors that we lower into a hole on an electrical wire line, which then transmit data back up through the line by using telemetry encryption," Young explains. "Not only do our surface computers require stable power, but we must have very little noise interference to properly decode the data transmitted back up the hole."

"Fluctuating power above ground is going to cause fluctuating power down the hole, and then corrupt the data." To ensure that reliable power is accessed from any location in the world, Baker Hughes uses Power Innovations' solutions. "UPQ systems have become a vital part of our surface hardware. They keep us running. They back up the data we retrieve for our customers, and they make sure the data is always safe."

Technological advances in communications, computing, robotics, and electronics are all a result of exploration. Although many things contribute to successful scientific and technological discoveries, clean, dependable power is a key component.

Powering the

Future

There is a worldwide focus on new ways to generate and meet the electricity needs for the future. The developed world is struggling with electrical supply shortages, blackouts, outdated distribution networks, and increased power-quality demand. Throughout most highly developed countries, there is a need to augment utility resources and replace outdated distribution networks. In many underdeveloped countries, power is inconsistent at best. It is hard to believe, but even today nearly one-third of the earth's population is still without even basic power.

Traditional power-generation sources create excessive pollution and deplete fossil fuels. Nuclear energy generation is perceived as dangerous. Even new hydro power-generation plants are being opposed. Current green energy resources (primarily wind and solar) are limited to nature and are unreliable. The fact is that power generated from all of these sources combined is inadequate to meet the demands of today's technology-dependent world.

Energy storage is also a must for future needs. Unfortunately, basic storage technology has not changed in decades…and it is time for change!

Power Innovations is implementing changes. The company is heavily involved in the development of the PowerWell,™ a revolutionary green, renewable power- generation technology. According to Robert Mount, President and CEO of Power Innovations, "For energy- generation solutions to be viable, they must be cost effective, have the capacity to generate power independently, make the best use of available utilities, return unused power to the utility grid, and account for all energy use."

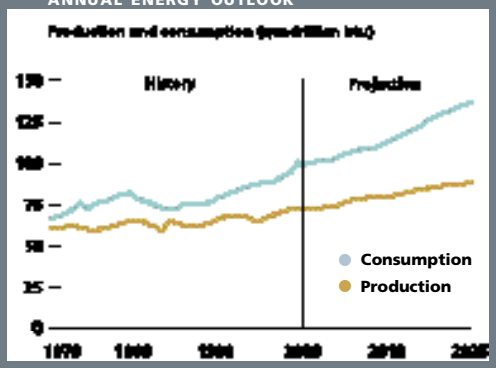
When available for distribution, the PowerWell will offer a worldwide solution for clean, reliable power generation in conjunction with or independent of available utilities. From inception, the company's new PowerWell technology is being developed to be scalable for homes, small offices, large businesses, and government entities. It will even be able to power cities.

The PowerWell is being fully integrated with all other Power Innovations' product lines. Integration of these technologies provides the ability to utilize power generated through the PowerWell in place of, or in addition to, all applications for which utility, generator, or battery power can be used. Power Innovations…generating and managing clean, reliable power for the future!

With the increasing dependence on electricity, supply simply cannot meet the demand. During the past decade, actual demand for power increased 35%, whereas capacity increased only 18%.

Source: Energy Information Administration, *Annual Energy Review 2001*

ANNUAL ENERGY OUTLOOK



Consistent, Quality Power is Essential

Power Innovations provides a new standard for power quality. The company's Uninterruptible Power Quality (UPQ) solutions deliver perfect, dependable-quality power to connected equipment—regardless of the quality of the incoming power. UPQ technology also enables on-site and remote management and control of power and provides backup power in the event of power failure. Power Innovations' solutions also enhance battery life and management.

Many forward-thinking companies, which provide the highest-quality products and solutions in their industries, are now incorporating Power Innovations' UPQ technology into their products to assure reliability and dependability.

Although competing UPS products are on the market, Power Innovations supplies unsurpassed solutions for today's power problems. The company provides all of the best features and functions available in the industry. In addition, Power Innovations' UPQ systems are smaller in size and weight, have the highest reliability ratings, and are superior in many other ways.

Today's solutions require a much higher standard of electrical power. A few years ago, industry could tolerate eight hours of power loss per year, a 99.9% power reliability factor. Much of today's equipment can tolerate no more than a 32-second loss per year, which represents a 99.99999999% reliability factor. Power Innovations' UPQ products deliver 100% reliability.

Businesses in virtually every industry—even homes—now require more power, as well as a much higher quality of electrical power. Power Innovations interfaces between connected equipment and incoming power. In addition to providing leading-edge power- quality solutions, the companys' products have the ability to adapt any piece of equipment to global power standards and to monitor environmental concerns—from humidity and heat to security on doors and windows.

Power Innovations—***powering life***!

Power Innovations is committed to supplying the best power-quality solutions to meet your current needs, while also providing new avenues for your energy needs in the future.

ROBERT L. MOUNT
President and CEO

Powering Life

Powering Miracles

Powering Peace of Mind

Powering Life's Connections

Powering the Human Spirit

Powering Freedom

Powering Innovation

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