

Disaster Recovery for Wireless Communications

An innovative vehicle delivers on-site recovery to vital utility communications. Built by Arcadian Networks in collaboration with Television Engineering Corporation, the vehicle anticipates virtually any communications platform.

By Robert Burchard

Though now a fragment of history, the slow-motion image captured on Sept. 11, 2001, of communications towers falling into churning clouds of debris that moments earlier had been the World Trade Center North Tower lingers as a reminder of the urgency of disaster recovery for communications. As utilities increasingly use wireless networks to link their widely distributed assets to a national energy smart grid, the need for preparedness is more clear than ever.

Recovery in smart grid era

Utility communications are undergoing a revolution in America. Seventy-three years ago, when the Rural Electrification Act transformed communities with electrical power delivery, utilities built systems on then state-of-the-art telephone communications technology. Today, there's a consensus that the utility sector needs a major overhaul to address aging power infrastructure, environmental concerns, national security issues and more. The computer revolution must take root in revitalized and reinforced utility network communications to transform the entire power grid to a smart grid. Wireless communications are poised to play a leading role.

With network telemetry, utilities could monitor their power delivery and

consumer needs with real-time data, allowing them to reduce wasteful excess capacity and inaccurate demand estimates and send production directives back to substations over high-speed wireless networks. The potential is tremendous. Edison Electric Institute (EEI) and research body Electric Power

Research Institute (EPRI) estimate that U.S. electrical usage could be cut by 10 percent through smart grid technologies, according to a 2008 report.

Wireless enables smart grid

Wireless networks provide a link between old and new technologies for



Photo 2:
In this view of the disaster-recovery vehicle, its two masts are raised.



Photo 3:
An interior view of the disaster-recovery vehicle shows selected controls.



Photo 1. A disaster-recovery vehicle arrives and engineers assess on-site needs.



Photo 4. The disaster-recovery vehicle delivers emergency communications wherever needed. Climate controls and emergency mechanisms equip it to perform in almost any terrain.

utility communications. In Minnesota, 16 electrical cooperatives linked to power generator and distributor Great River Energy have implemented a 700-MHz licensed wireless IP communications network from Arcadian Networks. These cooperatives, many serving rural areas with only seven customers per mile of power line, have wirelessly linked even their most far-flung substations back to their headquarters and, thus, to the regional power grid. With the simple installation of wireless communications, these rural power companies find themselves on the cutting edge of smart grid technology.

This trend continues. Arcadian Networks has acquired FCC licenses allowing it to provide secure, private networks in all or part of 30 states and in the Gulf of Mexico. With smart grid technologies in place, disasters can be more effectively prevented as well as recovered from. Real-time data transmitted wirelessly from substations can alert engineers to potential problems and allow remote deactivation or adjustments before problems arise. In the event of an unavoidable man-

made or natural disaster, Arcadian has initiated a proactive approach.

Recovery pre-smart grid

In the old days, or wherever the old legacy communications remain, disaster recovery involved finding the thing that broke and going and fixing it. Technicians work on one end of the communications route or the other. Smart grid support involves a more comprehensive event management. If a tower falls, for example, Arcadian can drive a disaster recovery vehicle to the site and replace the tower functions to a predetermined percent of capacity based on network RF design.

In the post-9/11, post-Katrina world, the implications are significant. Any utility linking its communications wirelessly has the foundation for a smart grid strategy, with its capacity for self-healing and greater resilience. When the disaster-recovery vehicle rolls onto a site, it delivers a continuous stream of vital, reliable, real-time critical data — until the tower damage or other disaster effects have been repaired. (See Photo 1)

Tricked-out service van

One of the disaster-recovery vehicle's key strengths is the multiplicity of technologies it can connect. Built in collaboration with Television Engineering Corporation (TEC), the vehicle anticipates virtually any communications platform and is equipped to connect with it. Built on a 2007 Dodge Sprinter 3500 with a stable wheelbase, the vehicle is a rolling communications command post.

The vehicle includes dual 56-foot pneumatic masts. One delivers fixed broadcasts. The other is for backhaul and link testing. Each mast can support 200 pounds and can be extended up to 20 additional feet over the pneumatic height with fixed masts. Three transmission lines as well as Ethernet and power run to the top of each mast. A camera and antennas mounted atop one can be remotely manipulated through 360 degrees of azimuth, which is useful for visually inspecting the path to, and zeroing in on, distant towers. (See Photos 2 and 3)

When the vehicle — all 11,000 fully loaded pounds of it — arrives on site, it's prepared to stay. The crew sets up the truck's stabilizers, activates emergency flashers, and kicks on the 8,000-kilowatt Oran brand generator. The generator shares the fuel tank with the 6-cylinder diesel motor, which can operate for 20 hours on a single tank of gas. The truck carries spare gas cans to refuel, if needed. A custom-built heat-management system can be set to optimal temperature for a variety of hardware platforms. The equipment and its crew can operate in desert or blizzard conditions. (See Photo 4)

Because disaster scenarios present unpredictable and potentially unstable environmental hazards, the disaster-recovery vehicle has extensive safety mechanisms and safeguards built into its equipment and software. For example, the van cannot be moved once the masts are up. And handheld remotes allow the crew to control antenna functions from inside or outside the vehicle, as needed.



Photo 5. The disaster-recovery vehicle can restore network capacity in an emergency situation through comprehensive management of problems with smart grid-ready technology.

Diagnostics and communications

Inside the van, it's a utility communications command center on wheels. Virtually everything a communications engineer would need to read data, send commands and communicate machine-to-machine or person-to-person is here. A 40-inch LCD display connects to multiple data sources, including the entire network-management system, and can intake multiple feeds simultaneously. The patch panel can connect "anything to anything" with its outlets for USB, Ethernet, cable and more. (See Photo 5)

The disaster-recovery vehicle is provided with a full-service agreement to customers, but is also available for service in event of a disaster resulting in a humanitarian need in local communities. On site, the vehicle can run diagnostics to assess needs and deliver wireless communications until full recovery plans can be put in place.

Readiness: For good or bad

Since it was built in mid-2008, the vehicle has not been called upon

to deliver disaster recovery, but has proved useful in demonstrations and diagnostics on-site at potential customers. It also attracts a crowd at trade shows, where engineers appreciate the important assistance the vehicle could provide in an emergency scenario.

"Working in Manhattan in September 2001, I saw for myself the vital need for proactive, responsive, resilient communications — and the challenges of delivering wireless signals in an emergency," said Jake Rasweiler, Arcadian Networks' vice president of engineering and network operations. "We're proud to have built a solution that's ready to serve in any scenario, while upgrading communications to a more secure and reliable smart grid-ready platform."

The disaster-recovery vehicle is a sign of the times. Not only of a greater awareness of the role of wireless networks in community response to emergencies, but also of their role in the changing technologies that are revolutionizing the energy sector. **agl**

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