# WHY IS HURRICANE KATRINA AFFECTING MY BATTERY LEAD TIMES ALMOST 3 YEARS LATER?

**Curtis Ashton**
**Power Maintenance Engineer, DMTS**
**Qwest**
**Littleton, Colorado**

## ABSTRACT

After the Hurricane Katrina disaster, the FCC opened an investigation (due to numerous complaints) into the reliability of 911 systems during that event. As a result of that, they issued a final order (after much legal wrangling throughout the year) towards the end of 2007. The primary focus of the order and all the controversy surrounding it is over backup power requirements. In the past, the FCC had "best practices", but no mandates for backup power systems. The new order actually specifies mandates (which exceed the past best practices in some instances) for backup power. The net result is that batteries (one way to achieve the backup power) are now going to be in greater demand in the U.S., probably increasing prices and lengthening lead times.

This paper will cover the types of sites and companies to which the Order does and does not apply. For those sites to which it does apply, there are a couple of differing requirements (dependent on site type) for the amount of backup required. In addition to mandates for minimum designed reserve power time, the order also requires "regular" maintenance and replacement of the batteries before they "deteriorate". The paper will also cover the differing technologies that can be used to achieve the required backup, with the focus on batteries.

## HISTORY OF THE ORDER

As you are aware, Hurricane Katrina struck the Gulf Coast of the United States on August 29, 2005, and caused extraordinary destruction to communications companies' facilities and communications services, primarily in Alabama, Louisiana, and Mississippi. The Federal Communications Commission (FCC) was not pleased with the performance of 911 systems during that disaster; so, in January 2006, they established the Katrina Panel, which reviewed the impact of Hurricane Katrina on communications infrastructure in the areas affected by the hurricane.

On June 12, 2006 the Panel submitted a report to the Commission regarding ways to improve disaster preparedness, network reliability and communications among first responders such as police, fire fighters, and emergency medical personnel. The Commission issued a Notice of Proposed Rulemaking on June 19, 2006 inviting comment on what actions the Commission should take to address the Panel's recommendations. On July 26, 2006, the Commission issued a Public Notice asking for comments to address the applicability of the Panel's recommendations to all types of natural disasters (e.g., earthquakes, tornadoes, hurricanes, forest fires) as well as other types of incidents (e.g., terrorist attacks, influenza pandemic, industrial accidents). The Public Notice also asked parties to address whether the Panel's recommendations are broad enough to take into account the diverse topography of the United States, the susceptibility of a region to a particular type of disaster, and the multitude of communications capabilities a region may possess.

In June 2007, the Commission released the Katrina Panel Order directing the Public Safety and Homeland Security Bureau (PSHSB) to implement several of the recommendations made by the Panel. Among other things, the Commission adopted a rule requiring the larger communications providers to have emergency/backup power for sites carrying 911 traffic. In summary, the rule required most Central Offices to have 24 hours of power backup; and remote switch sites, digital loop carrier sites, and wireless sites to have 8 hours of backup. In the FCC's mind, most of the affected companies were already mostly compliant to the order (that was definitely not true for many wireless carriers); so, the rule was to take effect on August 31, 2007.

On August 2, 2007, the Commission released an Order that extended the effective date of the backup power rule adopted in the Katrina Panel Order to October 9, 2007. The Commission did so on its own motion in order to provide additional time to consider the issues raised by CTIA (the Cellular Telecommunications Industry Association) in its Motion for Administrative Stay, and to hear from other concerned parties on the issues raised in that motion.

On October 4, 2007, the Commission granted in small part and denied for the most part petitions for reconsideration and/or clarification of the backup power rules stipulated by the Katrina Panel Order. They also added a few more onerous rules, including positive reporting on each and every location, not only as to the engineered backup found at those sites, but whether the backup is regularly maintained and replaced at end-of-life. The CTIA learned a hard lesson that the wireline carriers learned a long time ago: unless you want additional rules, don't ask the FCC for clarification. The order takes effect on the day that it is posted to the Federal Register; then the timelines begin.

## WHAT THE ORDER ACTUALLY SAYS

As mentioned, it is best not to ask the FCC for clarification of its rules, but to interpret them with the help of your legal department, and then stand behind your Legal departments opinions until the FCC tells you otherwise. Legal and Regulatory documents often leave plenty of room for interpretation (or misinterpretation, as the case may be). The power ordering clause of the revised FCC order is as follows:

**12.2 Backup Power.**

(a) Except to the extent set forth in Section 12.2(b) and Section 12.2(c)(4) of the Commission's rules, local exchange carriers, including incumbent local exchange carriers and competitive local exchange carriers (collectively, LECs), and commercial mobile radio service (CMRS) providers, as defined in Section 20.9 of the Commission's rules, must have an emergency backup power source (*e.g.*, batteries, generators, fuel cells) for all assets necessary to maintain communications that are normally powered from local commercial power, including those assets located inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. LECs and CMRS providers must maintain emergency backup power for a minimum of twenty-four hours for assets that are normally powered from local commercial power and located inside central offices, and eight hours for assets that are normally powered from local commercial power and at other locations, including cell sites, remote switches and digital loop carrier system remote terminals. Power sources satisfy this requirement if they were originally designed to provide the minimum backup power capacity level required herein and the provider has implemented reasonable methods and procedures to ensure that the power sources are regularly checked and replaced when they deteriorate. LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this rule.

(b) LECs and CMRS providers are not required to comply with paragraph (a) for assets described above where the LEC or CMRS provider demonstrates, through the reporting requirement described below, that such compliance is precluded by:
  (1) Federal, state, tribal or local law;
  (2) Risk to safety of life or health; or
  (3) Private legal obligation or agreement.

(c) Within six months of the effective date of this requirement, LECs and CMRS providers subject to this section must file reports with the Chief of the Public Safety & Homeland Security Bureau.
  (1) Each report must list the following:
    (i) Each asset that was designed to comply with the applicable backup power requirement as defined in paragraph (a);
    (ii) Each asset where compliance with paragraph (a) is precluded due to risk to safety of life or health;
    (iii) Each asset where compliance with paragraph (a) is precluded by a private legal obligation or agreement;
    (iv) Each asset where compliance with paragraph (a) is precluded by Federal, state, tribal or local law; and
    (v) Each asset that was designed with less than the emergency backup power capacity specified in paragraph (a) and that is not precluded from compliance under paragraph (b).
  (2) Reports listing assets falling within the categories identified in paragraphs (c)(1)(ii) through (iv) must include a description of facts supporting the basis of the LEC's or CMRS provider's claim of preclusion from compliance. For example, claims that a LEC or CMRS provider cannot comply with this section due to a legal constraint must include the citation(s) to the relevant law(s) and, in order to demonstrate that it is precluded from compliance, the provider must show that the legal constraint prohibits the provider from compliance. Claims that a LEC or CMRS provider cannot comply with this section with respect to a particular asset due to a private legal obligation or agreement must include a description of the relevant terms of the obligation or agreement and the dates on which the relevant terms of the agreement became effective and are set to expire. Claims that a LEC or CMRS provider cannot comply with this section with respect to a particular asset due to risk to safety of life or health must include a description of the safety of life or health risk and facts that demonstrate a substantial risk of harm.

(3) For purposes of complying with the reporting requirements set forth in paragraphs (c)(1)(i) through (v), in cases where more than one asset necessary to maintain communications that are normally powered from local commercial power are located at a single site (*i.e.*, within one central office), the reporting entity may identify all of such assets by the name of the site.

(4) In cases where a LEC or CMRS provider identifies assets pursuant to paragraph (c)(1)(v), such LEC or CMRS provider must comply with the backup power requirement in paragraph (a) or, within 12 months from the effective date of this rule, file with the Commission a certified emergency backup power compliance plan. That plan must certify that and describe how the LEC or CMRS provider will provide emergency backup power to 100 percent of the area covered by any non-compliant asset in the event of a commercial power failure. For purposes of the plan, a provider may rely on on-site and/or portable backup power sources or other sources, as appropriate, sufficient for service coverage as follows: a minimum of 24 hours of service for assets inside central offices and eight hours for other assets, including cell sites, remote switches, and digital loop carrier system remote terminals. The emergency backup power compliance plans submitted are subject to Commission review.

(5) Reports submitted pursuant to this paragraph must be supported by an affidavit or declaration under penalty of perjury and signed and dated by a duly authorized representative of the LEC or CMRS provider with personal knowledge of the facts contained therein.

(6) Information filed with the Commission pursuant to subsection (c) of this rule shall be automatically afforded confidentiality in accordance with the Commission's rules.

(7) LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this reporting requirement.

**THE INTERPRETATION**

The following is a summary of what Qwest believes is the proper interpretation of which site types are covered by the order, and what types of backup may be used. Others may disagree with this assessment.

- All Central Offices with Host, Tandem, or standalone switches must have 24 hours of backup (this backup could be a combination of batteries, supercaps, microturbines, flywheels, engines, fuel cells, etc.; with batteries and engine-alternators being the most common).
- All remote switch sites are only required to have 8 hours of backup.
- All fiber regen (signal regeneration) and microwave radio sites must have 8 hours of backup.
- All digital loop carrier (DLC) locations that are not on a Customer's Premises (where the Customer pays for the commercial AC power and possibly provides engine and/or UPS backup) or are not line-powered must have 8 hours of backup.
- Cellular/PCS sites must have 8 hours of backup.
- Portable gensets do not count for the 8 or 24 hour requirement unless they are dedicated to a single site.

Qwest does not believe that the following site types are covered by the order:

- Customer Premises locations where the landlord is paying for the commercial AC and possibly providing some or all of the backup. This includes fiber-to-the-home (FTTH) — FTTH is typically going to have 8 hours of backup for POTS (plain old telephone service) due to state regulatory rules even though it is not covered by this Order.
- Remote terminals providing only DSL.
- Line-powered (this is DC power at -130 to 380 VDC provided on twisted pairs from a remote location) Remote Terminals (RTs) — the site providing the line power is covered though.
- Voice over IP (VOIP) or other Data Services, regardless of whether it is providing 911 (some companies are offering "lifeline VOIP", which has an 8 hour backup, separately from non-lifeline VOIP; but this is not due to regulatory requirements).
- Locations where a local, tribal, or federal law precludes the addition of enough backup resources (these sites must still be reported, with the reason for the exception). One example of a situation like this might be a site providing telephony to the National Forest Service on their land, and where they will not allow the placement of an engine or enough space to place enough batteries for the 8 hours of reserve. Also, private legal agreements (such as one might have with a customer served by a site) can qualify for an exemption from the rules, but not from the reporting requirements. Exemptions are also allowed if there is a safety or health risk issue (I cannot think of any).
- Cable TV telephony (cable TV companies are not yet regulated by the FCC).
- Telephone companies (or even wholly-owned subsidiaries) whose telephony subscribers don't exceed 500,000.

For sites that are covered, here is Qwest's interpretation of what must be done to comply with the order:

- Within 6 months from the official posting of the order to the Federal Register, an inventory of the engineered backup power, the frequency of power routines, and whether the backup is being replaced at end-of-life at all of the "covered" sites must be completed and submitted to the FCC. This submission must also include upgrade plans for each site that does not meet the minimum backup requirement and is not deemed to be exempt.
- After the initial report, for any "covered" site that is not compliant, there are 6 additional months to become complaint; at which time we must update the FCC on our compliance status at those sites.
- The inventory must be periodically updated and submitted to the FCC (no timeframe is given — Qwest has chosen to do it annually, since we will perform routines that often).
- Sites not presently being regularly routined must have power routines added (the FCC does not specify what maintenance activities must be performed, or how often, but Qwest has decided that batteries should be maintained at least yearly, and engines at least monthly, according to criteria specified by Qwest — not by the IEEE or NFPA).
- If batteries are being left in past expected end-of-life, they must be replaced, regardless of what the engineered or actual reserve is.

**THE GAPS IN COMPLIANCE, AND THE COST OF COMPLIANCE**

For the large wireline telephone companies, they are mostly compliant in their larger sites (Central Offices, microwave radio sites, and fiber regen sites) that have flooded batteries. For example, Qwest was already compliant on the 24 and 8 hour rules, as well as the routines and replacement at end-of-life on all but 19 of the approximately 2000 sites that fit this definition.

Note, however, that I specifically did not include in the preceding paragraph those larger sites that have VRLA batteries. As we all know, the expected lifetime of larger VRLA batteries (regardless of arguments from various suppliers), even in a controlled environment, is about 7-9 years. Out of 803 of the larger locations where Qwest has these VRLA batteries in its long distance network, over 200 of them have batteries past the end-of-life (as proven by internal resistance readings and/or battery discharge tests). Because the battery reserve was originally so over-engineered at these sites, they definitely still meet the 8 and 24 hour backup requirements. However, they do not meet the FCC requirement to replace them when they "deteriorate".

The DLC world is where the wireline carriers have a much bigger problem. These hut or electronic equipment cabinet sites primarily are backed up only by VRLA batteries, and there are a lot of these sites to maintain. While these sites are engineered for 8 hours of battery backup, many are not regularly maintained or replaced. Out of over 23,000 DLC sites covered by the order, Qwest is doing regular battery routines on about 14,000 of them (leaving 9,000 to bring into compliance), and is past end-of-life on the batteries on at least 1,300 of them.

To become completely compliant, Qwest needs a one-time budget boost of over $22 million dollars. About $7 million of that will go to battery vendors; about $1 million to engine and AC switchgear vendors, about $1 million to tool vendors, about $1 million to software vendors, and about $8 million to engineering and installation vendors. The other $4 million is internal expense. Qwest also needs an ongoing commitment of over $12 million above present budget levels, with almost $4 million of that being committed to salaries for more personnel to do power routines at DLC sites, another $5 million for batteries, and $3 million for installation vendors.

Extrapolating these financial numbers for all of the major wireline carriers (excluding their wireless divisions), I expect a one-time budget expenditure of over $140 million, with ongoing additional costs of about $85 million. Out of the initial $140 million boost, about $50 million should go to battery vendors, with another $35 million additional ongoing annual incremental commitment to those vendors.

With all of that money, one would think that the wireline carriers have a serious problem. Their problems pale in comparison to those of the wireless carriers (which is probably why the CTIA complained initially). Of the top 6 wireless carriers, only one comes even close to generally meeting the 8 hour engineering design mandate at most of their sites, much less the maintenance and end-of-life replacement requirements.

Battery backup design at most wireless "cells" ranges from 1 to 8 hours. A few sites are designed with engine-alternator backup for the batteries, and at least two major wireless carriers are deploying fuel cells at a fair number of sites to get additional backup beyond the batteries. There are also a lot of picocells and femtocells (very small wireless cabinets below antennae) that were designed with no backup at all because they were meant only to provide additional coverage for weak signal areas. Wireless carriers who have those will have to decide with their legal departments (my company does not own their own wireless sites, so we have not produced a legal opinion on this) whether the FCC Order requires backup for sites that do not absolutely have to be there to provide 911 service. Many of the wireless cell cabinets that exist do not have room for additional batteries in order to meet the 8-hour mandate. Those sites will have to add battery cabinets, and in some cases secure additional right-of-way (which generally costs money too).

Because I do not work in the Wireless industry, I cannot provide reliable estimates of what complete compliance to this mandate is going to cost. However, I can make some educated guesses based on my experience and the knowledge that the major carriers have approximately 170,000 cell sites. I estimate that complete compliance will cost the major carriers in the Wireless industry over $400 million dollars in up front costs, with approximately $100 million of that going to battery vendors, and $150 million going to cabinet vendors. In incremental (above and beyond present spend) long term costs, an additional $30 million annually will go to battery vendors, $20 million to installation vendors, and another $25 million to battery maintenance vendors.

What this all means is that demand for industrial standby batteries (especially long duration AGM VRLA monoblocs) is going to increase significantly in the next couple of years. Based on my conversations with several battery vendors, while they are giddy over the prospects, I do not think most of them will ramp up production fast enough to meet the demand. This means that all companies will experience delays in getting their long duration stationary batteries. I do not know if the lead times will approach the ridiculous lead times of the late '90s through 2001, but they will definitely exceed present lead times.

## LEGAL CONSIDERATIONS

With all of this additional cost, many companies and industry groups are considering their legal alternatives.

Some wireless groups or companies are mulling whether to sue the FCC over the order.

Some Finance departments in some companies are considering whether it would be cheaper to pay the fines that the FCC might levy than come into compliance. While it is true that even if the FCC issued ever-increasing fines for non-compliance it might still be less expensive not to comply, that is probably not a wise idea due to the U.S. legal system of judges and juries.

Because this order is primarily concerned with 911 reliability, one can hypothesize a situation that actually happens in the court systems today, but extrapolate the consequences under this Order. That situation is a lawsuit resulting from 911 not working when a person is in distress. Today, there are a patchwork of local state regulatory rules regarding 911 and power backup systems. With a common FCC national rule, there is little room for legal wiggling. If a phone company (wireless or wireline) is unable to provide 911 service to a dying customer because backup power systems fail before the 8 hour minimum required backup time (regardless of whether it is due to under-engineering, or poor maintenance or replacement programs), they are then open to a lawsuit from the family of the deceased. A jury can award unimaginable punitive damages.

Companies that have calculated that the payouts due to death and/or injury would be less costly than fixing the problem have not fared well in the courts. In the early 1970s, the Ford Motor company was aware of a problem with exploding gas tanks on Ford Pinto hatchbacks when they were rear-ended. In internal memos, Ford detailed their calculations over the expected payouts to victims and their families versus the costs of recall. When a jury got ahold of these memos in an actual case, punitive damages were awarded that were 5 times the amount that the recall would have cost Ford.

The FCC requires a signed affidavit with each report, under penalty of perjury, so it is not wise to "fudge" the report in any way. The FCC does not specify who must sign, but in most companies it will be someone higher up the food chain than a power person.

## FAIRNESS OF THE RULES

Many have decried the FCC ruling as being “unfair”.

In a truly competitive, unregulated marketplace, companies that wanted to offer a higher quality of lifeline service would spend the money on the backup power, and then advertise based on their reliability (the Verizon Wireless commercials provide an example of this). For wireline carriers, regardless of the backup they put in their equipment, over 95% of all homes now do not have a corded phone, so a wireline phone does not work at those homes if there is a widespread AC power outage in the area, even though the phone company continues to provide signal. I am among the believers that mandated backup requirements are illogical, anticompetitive, and outdated. However, we remain a regulated industry (and I do not foresee a time in my career when we will not be regulated), and all the whining over the unfairness of the rules or regulations is not going to change them.

Others have pointed out that this rule does not apply to cable TV companies, who are one of the primary competitors to telephone companies for landline telephony service. That is true, and it is not “fair”; but the only reason it does not apply is because the FCC does not yet regulate cable TV companies. They have recently made headlines over attempts to apply a clause in the 1984 Cable TV Act in order to assert authority over the cable TV companies. Presently the cable TV companies do not have quite the market penetration necessary to trigger the regulatory oversight portion of the governing law. However, if the FCC ever does get authority over the cable TV companies, I virtually guarantee that these same rules will apply to them.

In sum, on this issue of fairness, I revert to what my parents told me (and I’m sure many of yours told you): “life isn’t fair, so get over it.”

## SUMMARY

For battery manufacturers, “the best of times and the worst of times” is about to return. Demand will be high (leading to increased profits) and lead times will be long (leading to angry customers). The “power pukes” in telecommunications carrier companies will finally have the power of the Federal government behind them when they go asking for money for batteries and battery test sets, and may even get their dream budgets (or at least more than usual). Battery service companies are going to get more work. Many project managers are going to get sick of endless spreadsheets of data to input and send to the FCC. In sum, this Hurricane Katrina Order is going to create some havoc and some fun!