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PLAN B:

Ensuring RF Readiness

April 2020

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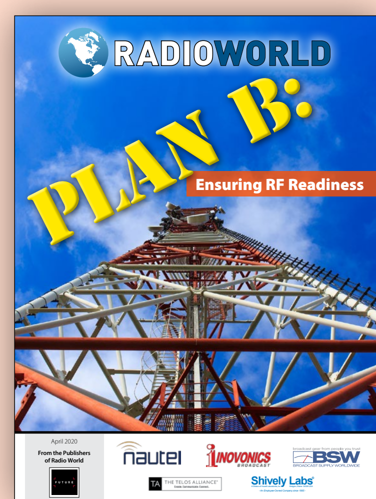
FUTURE



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PLAN B: Ensuring RF Readiness

Paul McLane
Editor in Chief

Radio operators may be very focused on the phenomenon of setting up broadcasts from home. But the RF chain is as mission-critical as ever — and lightning and hurricane seasons are not far off for many of our readers.

This ebook will help you make sure that your RF chains are ready for the unexpected.

If you had to create a checklist of RF preparedness — meaning everything after the studio or program source — what would be on that list? What questions should technical executives be asking right now to create a "higher level" of preparedness?

In this ebook, several industry veterans take on these questions.

Cris Alexander talks about major systems to consider, from your STL to your key personnel. Buc Fitch reflects on site "hardening." Ed Lobnitz shares resources for lightning protection. We took input from engineers like Robbie Green of Entercom, Larry Wilkins of the Alabama Broadcasters Association, Michael LeClair of WBUR and Doug Irwin of iHeartMedia, as well as our sponsors Ben Barber of Inovonics, Dale Ladner of Shively and Frank Foti of the Telos Alliance.

And we take a look at a new list of 25 best practices for "station resiliency" just published by the FCC's Communications Security, Reliability and Interoperability Council.

Read on to learn how radio stations can ensure that their RF chains are ready for anything.

Major Systems to Consider in Creating Plan B

Think hard about where you might need redundancy, from your STL to your key personnel

By **Cris Alexander**

The author is director of engineering at Crawford Broadcasting and technical editor of Radio World Engineering Extra. We asked him for key points to consider to assure the continuity of your airchain operations.

STL — If a station doesn't have a diverse-path backup STL already, it needs one for the tough times. By "diverse path," I mean a path that has no or little commonality with the main STL whatsoever.

If the main STL is a conventional 950 MHz or a Part 101 microwave link that uses a tower at the studio and a tower-mounted antenna at the transmitter site, the backup should use infrastructure that does not employ the tower or tower-mounted antennas — perhaps the internet or some sort of point-to-point telco circuit. If the worst happens and you have an antenna, line or tower-mounted radio problem and cannot get a qualified tower climber up to fix or replace it, you need a place to go. Those who use all wireline STLs may want to consider a wireless internet option as a backup in case of "backhoe fade."

Transmitter — Obviously stations need auxiliary transmitters. Even the best and newest transmitters will occasionally fail or need maintenance.

Do you have a place to go? Will going there exact a penalty in coverage or quality? Is going there a simple, one-button action or does it require a number of steps to make it happen? Is the aux in good shape and will it

Auxiliary FM antennas often are mounted lower on the tower, exacting a coverage penalty when used.

Is your auxiliary transmitter well maintained, regularly tested and ready to go on a moment's notice?

come up when you hit the button? Is it tested on a regular basis, and it is maintained in excellent, ready-to-run condition?

Audio Processing — So often the audio processor is a bottleneck in the system, a single point of failure.

Some engineers get around this by employing a different audio processor for the aux transmitter. This isn't a bad way to go, but so often that different audio processor is an older model, whatever was retired when the current box was installed, and as such, there will be a different sound when going to the aux transmitter, and that's not good.

A better option, but one that requires some engineering, is to have a backup audio processor that can be brought on line quickly and easily should the main processor fail but using the main audio processor to feed both main and aux transmitters (or using two identically-programmed audio processors to feed main and aux transmitters).

A good approach is to feed the main processor in via AES192 and the aux in by composite, with switching between the two as simple as selecting the input to the exciter.

Remote Control — What happens when the remote control fails, or when its connection to the outside world fails? Some form of backup is needed. Modern AUI-equipped transmitters can work as their own remote controls in a pinch, but it is difficult or impossible to control external equipment with such.

A low-cost web/telephone-based auxiliary remote control connected in parallel with critical functions of the main is a good option, but it should have different connections to the outside world as well.

Many modern remote control systems offer SNMP capability, and so do many modern transmitters. Connecting them together can result in something akin to drinking from a fire hose, but by carefully choosing which critical parameters are monitored and alarmed, we can keep a much closer eye on our sites and know that we have a developing problem before it affects the on-air operation.

Auxiliary Antenna — Occasionally, antennas do fail. Lightning can strike them, O-rings can dry out and crack and permit water ingress, or Bubba can miss while shooting at the lights and put a hole in the transmission

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line or an antenna bay.

We need a place to go when that happens. Often, this takes the form of the old antenna mounted lower on the tower, and this is a good option, but it exacts a penalty in coverage. The aux antenna should be as good as it can possibly be, as high as it can possibly be, and it should be tested and inspected regularly to keep it ready to use in a hurry.

Auxiliary Systems — Some stations take the "auxiliary system" approach and leave the aux transmitter connected directly to the auxiliary line and antenna and perhaps even fed with the backup STL, audio processor and PPM encoder.

Stations that can afford it (or can't afford not to do it) should consider some sort of off-site auxiliary system, sited at a completely different geographical location.

That has the advantage of "one-stop shopping" when anything goes wrong — just switch transmitters and you're back on. But that approach often exacts a significant penalty in sound quality and coverage.

A better approach is one that is flexible, where the aux transmitter can be connected to either main or aux antenna, fed by either main or aux audio processor and either STL. Many audio processors have multiple inputs and automatic "failover" that can keep the hits playing when one or the other STL path fails, and that's a good thing, but how do you know when that happens? Will your first indication that there is a problem be when the backup STL also fails and you have silence on the air?

Off-Site Auxiliary Facilities — This is not for everyone, but stations that can afford it (or can't afford not to do it) should consider some sort of off-site auxiliary system, sited at a completely different geographical location.

Licensees that have multiple stations in a market with different sites can sometimes provide their own auxiliary sites. Others can sometimes make a deal with other licensees, even competitors, to host each other's off-site auxes.

If a tower comes down in an ice storm, tornado or as a result of vandalism or from some other cause, those stations would have a place to go to keep playing the hits with minimal impact on the audience and bottom line.

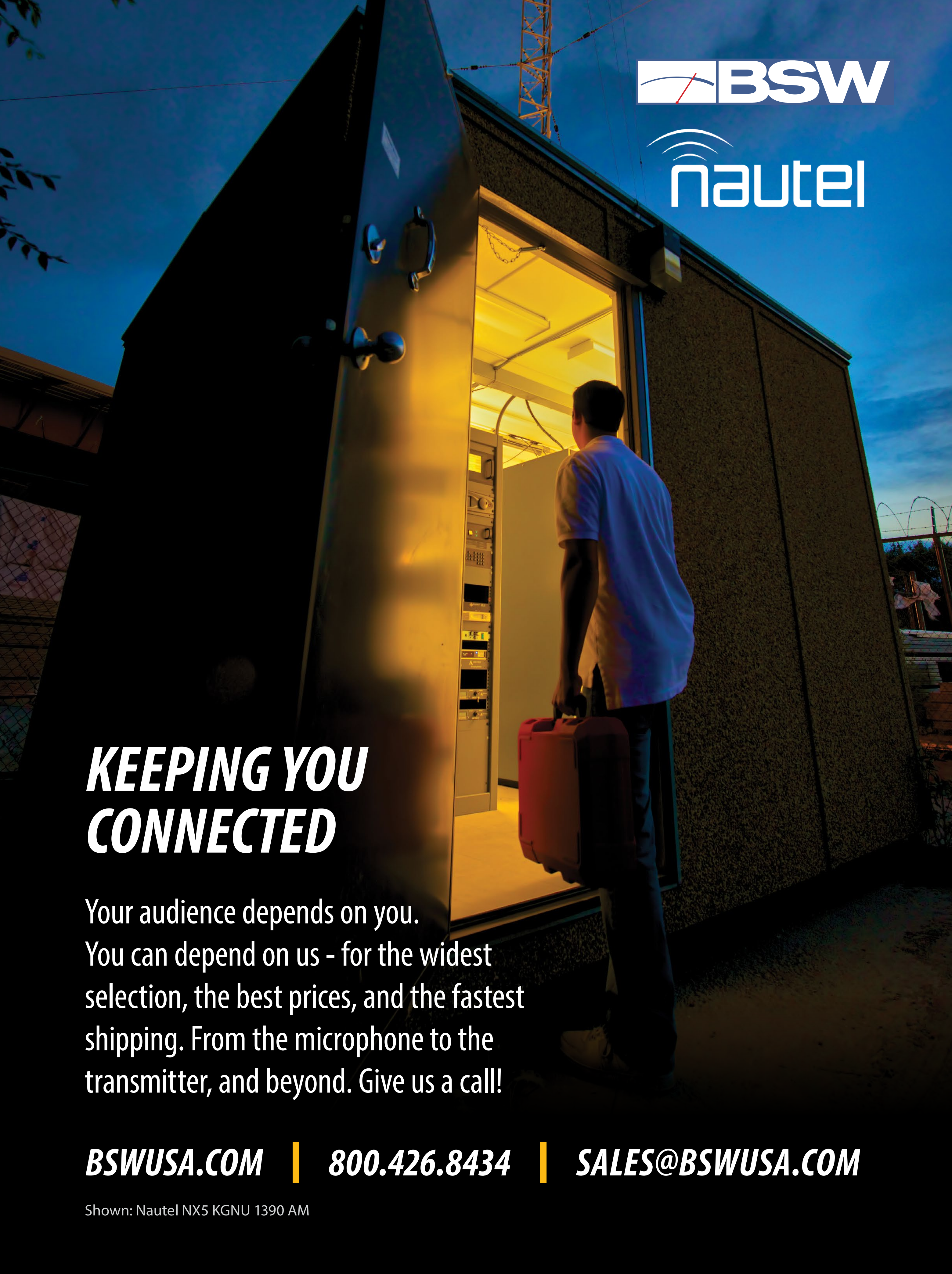
Personnel — If there is one thing we have learned from the coronavirus crisis, it is that we may have to make do without our regular people.

Do we have others we can call upon for critical functions? Is there a contract engineer or contract engineering firm we can use if our engineer is for whatever reason unavailable? What about IT personnel? Tower crews? Electricians? HVAC service personnel? Are we prepared with a list of people on which we can call in a pinch?

Remote Access — There is little excuse in this day and age for not having a "connected" transmitter site.

Modern transmitters have built-in web servers and graphical user interfaces. Remote control systems are web-enabled. Even our HVAC systems can be remotely controlled with affordable WiFi-enabled thermostats. Security cameras and DVRs are built for remote connection and can help us quite literally keep an eye on our transmitter sites when we can't physically be there. My company has relied on this during wildfire closures and weather events when we couldn't get to a site. Many security systems are also internet-connected/enabled so that they can be armed and disarmed remotely. If code-access lockboxes are provided for building access, an engineer could allow a contractor access to a transmitter site or building without going there, watching on the security camera array and disarming/rearming the alarm system at the appropriate time. Some systems even permit two-way audio, which could also come in handy. ■

A Part 101 IP microwave link is a good primary — or secondary — STL.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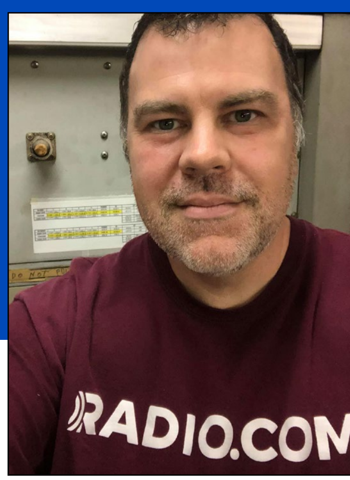
Lessons Learned in Houston Radio

Talking resiliency and best practices with Entercom's Robbie Green

Q

A

Robbie Green
Entercom



Lightning and hurricanes are familiar threats in Houston, which, with nearby Galveston, constitutes radio market No. 6 for Nielsen Audio. There are nearly 6 million people age 12+ in the metro.

Robbie Green is director of technical operations for Entercom in that market.

Radio World: *Describe the RF infrastructure that supports most of the FM stations in your market, and how redundancy plays out there.*

Robbie Green: Virtually all of the non-rimshot commercial FMs here in Houston have a backup transmitter available at a site separate from their main site. Nine of the biggest stations in the market share the Senior Road Tower, and all of them have a backup site near Senior Road that allows operation that comes close to duplicating their primary coverage.

For example, all of my stations operate with near-maximum full C facilities from Senior Road. The backup for two of them is 76 kW at 1,750 feet, and the others are 70 kW at 1,500 feet. At all four of mine, when we switch to the aux site, the listeners would be hard pressed to tell, as we maintain HD Radio operation and even the exact same processing as at the main site.

All nine of the Senior Road stations maintain an antenna of last resort at the 1,000-foot level on the main tower. Each one is a single-bay ERI, which can deliver about 9 kW out with normal, licensed TPO going in. It actually looks like a nine-bay Roto-Tiller when you look up at it, but in reality, it's nine one-bay antennas.

RW: *Hurricanes and lightning present annual threats, and particularly in that part of the country; how do you manage your facilities to protect against those?*

Green: With regard to lightning, in my experience anyway, well-grounded towers rarely experience equipment damage due to lighting.

One memorable exception to that rule was when lighting blew a hole into the top of a radome at a station in my hometown many years ago, but even then, it was the water inside the radome bending the top antenna bay downward that caused the issue, not a surge.

MOV devices lose a bit of their effectiveness with each surge they send away from the equipment to ground, so they have to be maintained like any other piece of equipment.

By far, most of the equipment damage I've seen has come from surges that came in on power lines. We employ high-quality MOV surge suppressors to help deal with those, but they do have to be checked regularly. MOV devices lose a bit of their effectiveness with each surge they send away from the equipment to ground, so they have to be maintained like any other piece of equipment.

Hurricanes are a preparation game. When the wind is blowing 120 miles an hour and things are flying through the air, you're not driving to a transmitter site if you're

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To All the Radio Engineers Out There Helping Stations Stay On-Air:

Thank You for Keeping Us Together.

To see new tips for broadcasting remotely from Telos Alliance engineers and videos on how other stations are doing it, visit TelosAlliance.com/Remote-Broadcast

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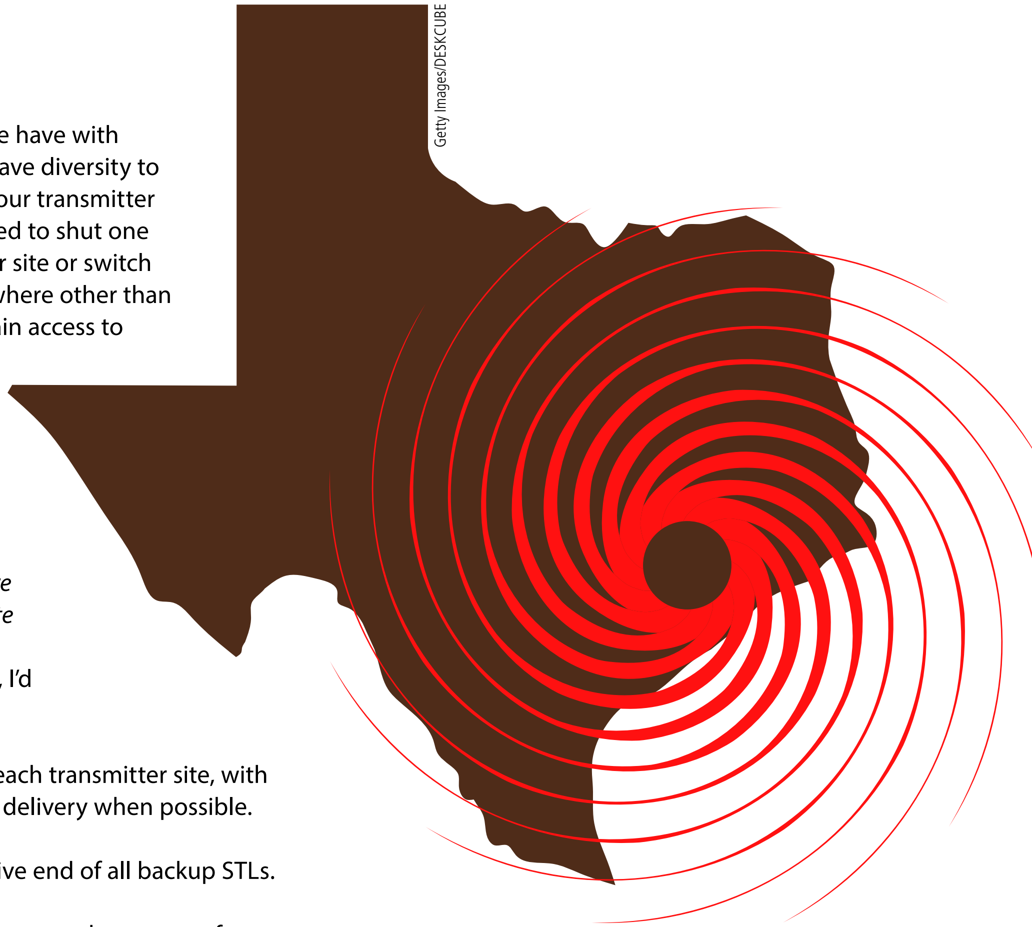
sane. Much like the diversity we have with STLs (wired and wireless), we have diversity to help us maintain contact with our transmitter remote controls; should we need to shut one site down, transition to another site or switch to audio delivered from somewhere other than our studios, we need to maintain access to our remote control systems. Having enough different tools at enough different sites is the key to staying on the air when your sites are inaccessible.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***RW:** What should stations be sure to include on their transmitter site checklists?*

Green: Aside from the obvious, I'd suggest:

- Redundant audio paths to each transmitter site, with a mix of wired and wireless delivery when possible.
- Silence sensors on the receive end of all backup STLs.
- Even with silence sensors, listen to the output of backup STLs during regular site visits. Some A/D converters fail in a way that they send white noise down the line, and would never trip a silence sensor.
- Test all backup facilities regularly to help insure performance when they're necessary, ideally to air, so any antenna system issues can be identified. Backup antennas take lightning hits too.

It sounds like a bad attempt at humor, but the Number 1 thing managers should know about their transmitter sites is their location and how to access them.

This is probably less critical in major markets, where the technical staff is likely to be at least a few people, but I've heard several stories over the years where incoming engineers had to locate, then break into their own sites after starting a new job, because nobody knew where they were or had spare keys.

The same goes for passwords to any mission-critical systems, like admin-level passwords to remote controls, audio processors and transmitters. I've been the replacement for terminated engineers before, and had to spend quite a bit of time resetting equipment to factory defaults during my first week on the job, just to gain access.

Ideally, every station would have at least two different transmitter sites they can broadcast from. Obviously, this isn't always possible. It typically becomes more possible as market size increases. For small markets, a lot can be done to help restore stations to air as quickly as possible. Every market should have a backup STL transmitter and receiver (whether RF or wired) that is capable of being used for any of their stations. Small-market FM clusters should always have at least one exciter capable of broadcasting on any of their frequencies sitting on a shelf, and the necessary adapters and other hardware to plumb it into the transmission lines handy. Even 50 Watts into the average FM antenna system provides surprisingly good coverage of most small markets in a pinch.

Managers need to understand that their engineer will need to test any repairs to the main transmitter before placing it back on air, so every market should have at least one reject load (or dummy load) available for this type of testing. If the engineer can't test with a load, they must test with the antenna system — and you'll be off the air while they're doing it. ■

Hunt Down Those PPoFs in Your Power Provision

Consider potential points of failure when seeking to "harden" your transmitter site

by **Charles S. Fitch, P.E.**

A transmitter site is the narrow neck of a bottle — the departure point before the audience receives our product. At most stations, the site is remote from the program source and is unmanned.

"Hardening" the site must involve more than fencing and signs. If you're serious about your business and your signal, your plant must be robust, durable and capable of self-healing.

Generally speaking we have three areas of concern: security, functionality and provision. Each requires that you identify potential points of failure (PPoF); develop the best solution or methodology to strengthen or eliminate the weak points; and implement those changes.

Is your site getting power from the best feed — not just the feed that is most convenient for the utility?

Of the three, I am most involved in provisioning: Does the site have everything needed to operate properly, optimally and continually?

The list of items that could take you off the air is endless. PPoFs that might be found in any plant include poor system design or layout; equipment inappropriate or insufficient for the task; poor maintenance; and insufficient spares for items that wear and can fail without warning. Then are the many potential points of failure specific to a particular installation.

I have written it so often that we should use an acronym for it, but: *You cannot afford anything less than the best when that item is in the mainstream of your business.* One can skimp on office trashcans and amenities or client lunches. But if a piece of gear is in the air chain, it has to be the best and operating at peak. The audience knows a station by what it hears on the air; the signal and sound had better be terrific.

ASK YOURSELF

Some nuts and bolts of power provision:

Is your site getting its power from the best feed — not just the one that is most convenient for the utility?

Is your power tap on the neighborhood feed, or the area feed? The former can add thousands of additional feet of wire and dozens of poles to your circuit — not to mention that your plant may be on a common primary and secondary distribution, which means that your supply is very communistic; every fault and suffering on the system you will get as well, including noise, poor regulation, uneven phases.

Sometimes the solution is just to move your transformer feed to the top conductors on a multi-circuit pole. If your power quality (PQ) is truly poor, you may need a separate feed from a cleaner, more reliable supply point.

How about your supply transformers? Properly grounded? If on a pole, properly supported? Properly GEP wired, or a mess of 14 neutral splices under a single wire nut? Phases balanced? Clean sine wave, or showing artifacts of square wave issues from overloading? Can you fry eggs on the top of your pad-mounted transformer when all the users have their HVAC running wide open?

Each of these defects indicates a potential point of failure.

GENSETS

Generators are the next line of power defense and involve their own maintenance requirements.

Periodic maintenance is a must. This is more than punching the date card on the attached tag.

Generators must be tested under load … all the loads! If one generator supplies all site users, all loads on that generator should be operated simultaneously on the generator for at least half-hour, every month.

With all loads present, is the voltage solid on spec, and not sagging when motors such as AC compressors

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Getty Images/JodiJacobson

Generators must be tested under load … all the loads!

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start? Is the output frequency 60 Hz? Will it operate automatically in the event of any of the five critical failures (loss of phase; phase reversal; high or low line voltage; and total loss of power)? Are the block heaters running? If the unit is thermostat-controlled, is the thermostat functional and set at the appropriate coolant and ambient temperature?

No matter what, every generator should be exercised on a weekly basis for at least 20 minutes.

Every generator should be exercised weekly for at least 20 minutes. All loads should be operated simultaneously on the generator for at least a half-hour every month.

Batteries should be maintained on an appropriate trickle charger. The batteries themselves should be replaced on the recommended schedule of the generator manufacturer. If none is given, the batteries should be replaced on a three-year increment, but sooner if exposed to extreme temperatures.

Calculate the run time provided by fuel stored on site. Extensive backup generation may not be much help if you need it for days and only have fuel for a few hours.

For many reasons, keep fuel tanks as full as possible. Emulate cellular operators who place sensors on tanks to signal that a tank needs a fill. This level signal is usually a DC analog; your remote control can use this value as an alarm limit. When the tank is, for example, three-quarters full, you can call the fuel service to top off. A second value could be one-quarter full, so that you will be kept aware of how much longer the site can run during a long-term outage. One of my clients has a remote control with an action program that calls the fuel service automatically when either of these limits is reached.

All tanks should be protected from such dangers as falling ice, and secured firmly with fences and spill sumps. Locks on fills are a good idea, especially during times when diesel is expensive and liable to be siphoned from remote unsecured fuel tanks.

We mentioned spare parts. For to the generator, you should have at least two oil and two air filters on the shelf, as well as a set of fan belts and a complete change of oil plus a quart. You do not want to go hunting for these parts at 3 in the morning or when off the air.

For more on this subject, including past articles by the author on buying and installing generators, visit radioworld.com *and search "fitch generator."* ■


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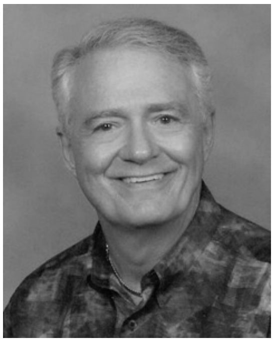
Harden Your Facility Against Lightning

Distinguished EE Ed Lobnitz shares useful resources to help you guard against bolts from the blue

By **Edward Lobnitz, P.E.**



The author, retired principal/senior electrical engineer of TLC Engineering Solutions, wrote the chapter on lightning protection for towers that has appeared in several editions of the NAB Engineering Handbook, including the most recent. The chapter is recommended reading and goes into considerable depth. But for engineers who are reviewing their air chains and thinking about business continuity in the face of lightning threats, we asked Lobnitz for some general advice and resource suggestions.

Let's assume that we are talking about existing, installed systems that are in full operation, including transmission sites, electronic systems and racks, associated buildings and backup generators and/or UPS systems.

The design of such systems, when new, requires considerable thought and detailed design considerations to "lightning harden" facilities so that lightning and its effects are handled so as not to interrupt operations or cause extensive damage to tower sites and associated facilities.

I have previously prepared and have available a "Design Manual for Antenna Systems — Grounding, Bonding and Lightning Protection" when constructing new facilities is anticipated; it is also useful in evaluating the adequacy of existing installations from a lightning protection standpoint.

In fact, it would be a good idea to review existing installations, using the manual, to provide a base knowledge that existing systems were "lightning hardened" when first installed. (To have this and the other resources mentioned in this article emailed to you for free, see the end of this article.)

As for existing facilities and protection against lightning effects, I would suggest reviewing all existing maintenance procedures and documentation from the time that the facilities were constructed and comparing them to the document "Maintenance Guide for Antenna System Grounding, Bonding and Lightning Protection" which I prepared a few years ago.

Maintenance inspection frequency cannot be overemphasized — especially after any environmental conditions such as corrosive atmospheres, storm frequency and severity, any alterations, or extreme seasonal changes.

The maintenance inspections should include visual as well as complete testing and keeping complete records and test data. Another document I have prepared for maintenance help is a "Site Audit Check List/Report" that can be used as a first-time guide and to build on as future inspections are made. (For a free copy, see end of article.)

Lightning protection for facilities should always be either UL certified, Lightning Protection Institute (LPI) certified or both, to ensure the installation is properly and effectively protected.

Lightning protection for facilities should always be either UL certified, Lightning Protection Institute (LPI) certified or both, to ensure the installation is properly and effectively protected.

Also, familiarization with Underwriters Laboratories UL 1149-Standard for Surge Protection Devices, 4th edition and National Fire Protection Association NFPA 780-Standard for the Installation of Lightning Protection Systems, 2017 edition, is highly recommended.

Also important where generators are involved is NFPA 110-Standard for Emergency and Standby Power Systems, which includes generator maintenance checklists. The Lightning Protection Institute is similar to UL in regards to lightning protection system and installer certification but is solely dedicated to lightning issues. I used to be on their board of directors and was also on the UL-1449, 3rd edition committee.

The author has kindly agreed to allow Radio World to share three resources with readers who ask. These include "Design Manual for Antenna Systems — Grounding, Bonding and Lightning Protection," "Maintenance Guide for Antenna System Grounding, Bonding and Lightning Protection" and "Site Audit Check List/Report." There is no cost. Email a request to Editor in Chief Paul McLane at radioworld@futurenet.com.

Ed Lobnitz also welcomes questions from readers. Email ed.lobnitz@gmail.com. ■

MAINTENANCE CHECKLIST

This is an excerpt from "Maintenance Guide for Antenna System Grounding, Bonding and Lightning Protection" by Edward Lobnitz. This checklist is part of a discussion about inspecting lightning protection systems, grounding, bonding and related equipment:

A. The following data should be taken to the site or reviewed on-site if available:

(1) As-built drawings.
(2) Shop drawings or data sheets for all components.
(3) Prior test reports for:
 (a) All grounding measurements.
 (b) Soil pH.
 (c) Soil resistivity.
 (d) VSWR measurements at all coaxial surge suppressors.

(4) Prior inspection and maintenance reports.
(5) Clamp-on ground resistance meter.
(6) 3-pole ground resistance test meter.
(7) Digital camera.
(8) Sensitive clamp-on ammeter.
(9) Binoculars.

B. Check the following components for corrosion, damage, modifications or removal:

(1) Coaxial shield ground kits on the tower. Use binoculars or climb tower to make inspection.
(2) Grounding cable and connections to the tower base.
(3) Guy wire jumper and ground wire connections.
(4) Entrance bulkhead cable boots, mounting provisions and grounding connections. Check cable boots for pliability, cracks and leaks.
(5) Ground bar connections in all racks and RF cabinets.
(6) Single point ground. Meter and record all values. Compare to previous ground readings. Test for any current flow on each ground connection with the clamp-on ammeter. Record any readings and compare with previous readings.
(7) Record number of lightning strikes on the lightning strike counter (if provided). Inspect the counter for any obvious damage.
(8) Inspect all coaxial, low voltage, DC and 120V surge suppression devices related to the antenna systems. Measure VSWR reflected energy at each coaxial suppressor and compare to previous readings. Replace suppressors if VSWR increases more than 10% of if damage is apparent. Replace all suppressors every 3 to 5 years. On low voltage, DC and 120V surge suppressors observe failure lights if available and inspect for damage or inoperative equipment.
(9) Review all underground grounding cable and strap for any obvious dig-ins or construction activity that might disturb the system. Dig up any suspect areas and inspect grounding continuity.
(10) Verify that the main building service surge suppressor is still functional by observing failure lights. Proper functioning of this suppressor is important to the life of all low voltage, DC and 120V suppressors.
(11) Use the clamp-on ground meter to check all building lightning protection downlead ground terminals, walk the roof to observe any damage to the system, such as loose cable supports, damaged, missing or loose air terminals, broken cable, loose connections, etc., the system must be inspected by a U.L. certified lightning protection contractor and recertified by U.L. every five years.
(12) Review generator test logs for compliance with NFPA 110, Standard for Emergency and Standby Power Systems, maintenance requirements. If generator is not being tested, recommend a testing program be set up to test and record data per NFPA 110.
(13) Test UPS units serving the racks for proper operation. Follow manufacturer's Maintenance and Test Guidelines.

C. Prepare a report of all inspection results, repair recommendations or other suggestions and include an album of all pictures taken, properly identified and referenced in the report as appropriate.

"Redundancy Should Be the Key Word"

We asked more than a half-dozen experts to list key points to consider in creating Plan B

For this ebook, Radio World sought further tips from more than a half dozen experienced engineers and our ebook sponsors. Here's a sampling of what they told us.

LARRY WILKINS
Engineering Academy Director
Alabama Broadcasters Association

"In broadcasting, redundancy should be the key word," says Wilkins.

Broadcasters are expected to remain on the air no matter what, and in situations that could affect the life and death of people in a community, broadcast is the main lifeline for emergency information.

"When designing or upgrading a facility, plans should include backup systems and equipment that either switch over automatically or have access from outside the facility."

The link between studio and transmitter is one place where redundancy is important, he said. "No matter what system you are using as the primary link, have one or two backup connections between the studio and transmitter. The best backup (if budget allows) is to have an off-site studio. Some modern transmitters can play preprogrammed audio either from a thumb drive or hard drive, if audio from the studio fails."

At the transmitter, it goes without saying that having a backup solves many problems, not only in case of failure of the main transmitter but allows maintenance to the main unit without going off the air or those after midnight maintenance schedules, he said.

"I suggest creating a line drawing of the program path at the transmitter (and the studio as well). Every separate piece of equipment that the program is routed through should have a backup. If possible, having a way for switching between the main and backup from outside the facility would be helpful if access to the site is not possible. Most sites will have coax switches to transfer between main and auxiliary transmitter plus between main antenna and a backup antenna."

Don't forget to have an alternate means to control everything remotely. Cell units are now designed to be used as interfaces to remote control units.

"I hesitate to mention backup power generators since every engineer realizes how important they are," Wilkins said. "But these units should be tested on a regular basis. Don't forget to inspect the fuel tanks as well."

Have a qualified contractor service the generator at least annually, including load test. Engineers can do their own load test by pulling the main disconnect to the facility. This will also test the transfer switches.

"While we are talking about contract service, the same is true if your site has an air conditioning system. Have a qualified HVAC contractor complete an annual service."

Wilkins said it's crucial to test all backup equipment and systems regularly. "It doesn't do any good to have all this redundancy if something doesn't switch or the backup is not working. The best test is to simulate a failure to see that the switching takes place correctly. Make notes in your transmitter site maintenance log of all the tests."

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DOUG IRWIN
Vice President of Engineering
iHeartMedia Los Angeles Region

Doug Irwin is a Radio World contributor and former editor of Radio magazine; he points readers to a useful past article about building a reliable transmitter site that can be found at [https://tinyurl.com/rw-irwin-site.](https://tinyurl.com/rw-irwin-site)

He shared several specific thoughts about redundancy planning with the current pandemic crisis in mind:

- Spare amplifier modules/power supply modules/tubes. "Clearly every transmitter site should have these available as a matter of course, but now, taking deliveries might be problematic. For example, if you needed parts that were sourced from China, you could be in real trouble right now."

- Regular services. "If you were to need air conditioner service, or a diesel fuel delivery, would that happen? The people you normally deal with could be staying home from work, or worse, ill themselves."

- Engineers staying home from work. "Here in L.A. we still have an engineering presence in the building but it's only one person at a time. We're stretched thin on purpose of course."

- Reliance on Telco for STL. "We use plenty of connectivity from ATT and Spectrum Enterprise. Fortunately we have parallel radio shots (in most cases) and so we wouldn't be in real trouble if a 'wireline' circuit were to suddenly go away. On the other hand, if we were limited to using wireline, and a major failure occurred, we could be in trouble. How well have those organizations left their facilities staffed and are there people willing to work out in the field right now?"

- Physical redundancy. "Normally I'd add that, in an ideal world, every station should have a backup site at a location that is removed from the main to the extent that physical issues don't negatively affect both sites, like in our case, fire or landslides at Mount Wilson. The issue we find ourselves dealing with at present, though, is in some ways tougher than that for sure. While access to personnel is always an issue, now it is more acute than ever, and that's probably the largest potential issue any of us have to deal with."

BEN BARBER
President/CEO
Inovonics

Barber note that Inovonics makes not only modulation monitors but other confidence monitors that will alert station personnel if something goes wrong at the site.

A monitor can let a user know 24/7/365 of any issues. "The technical staff can diagnose if the audio got to the site and whether or not the failure is received audio or transmitted audio. An invaluable bit of information to have before you go to the site. The bottom line is that if you want to know what's happening at your transmitter site, you need something there monitoring your signal."

And how can stations harden the on-air processing portion of their air chains against failures or unexpected critical problems? "Put the processor at the transmitter site," Barber said. "If it is bolted into the rack next to your transmitter, you are less likely to have issues of over-modulation or noise getting through your processor.

"Also, most processors have a main and back up audio path that they can 'choose' from. This is a great 'insurance policy' to make sure you stay on the air with meaningful programming."

FRANK FOTI
Executive Chairman
The Telos Alliance

Foti says that when Telos developed its AoIP technology, its vision was an ecosystem that enabled broadcasters extreme amounts of flexibility. "The writing was on the wall, with regards to an operating infrastructure based from a software engine. From this platform, we can create the entire broadcast environment using networking technologies."

He said this goes beyond studio infrastructure. "We can route signals to various locations using single-point, or multipoint connections. Signal processing, alert system messaging and ratings watermarking methods all are capable of being implemented in this environment."

How can stations harden the on-air processing portion of their air chains?

"The 'best practice' I've always adhered to was having a backup system available," Foti replied. "Depending upon the type of failure, there are numerous options available today, which were just wishful thinking in the past.

"If the problem is such where the link is lost, yet the processor and transmission path are operating, it makes sense to have a 'hot standby' content generator installed. Some processors offer that internally. If the processor itself has failed, then having a standby unit is a good insurance policy to have. There are methods available that detect a loss of audio, or MPX, signal and then automatically switch the stand-by on-air."

The advice to establish backup systems goes beyond processing. "Today, the air chain may consist of a ratings watermark system, emergency alert device, audio processor and the exciter. Having the ability to switch out any one of these, for a given 'fault' will reduce lost airtime."

Also, given that most air chains are operating 24/7/365, it makes sense to check them periodically for wear or other problems due to age.

"Even though this type of equipment is designed to be rock-solid, components do age (especially power supplies) and those can become a potential weak link. This, by the way, is applicable for all gear in the broadcast plant, not just the air chain."

JEFF WELTON
Regional Sales Manager
Nautel

Welton reminds us that in addition to the resources mentioned elsewhere in this ebook, don't forget to pay attention to your IT infrastructure, with respect to security — hardening, firewalls, VPNs or VNCs and so forth — as well as continuity of control – e.g., who knows the passwords to the equipment.

"Slowly, broadcasters are coming around to the concept that most of their gear is IP connected and that some level of security is required," Welton said. "But I couldn't count the number of calls we get looking for a backdoor to reset passwords, because the person who was in control of them is no longer available.

"Folks need to start thinking of passwords as the keys to a building. Typically no one person holds all the keys to the studio, so why would they hold all the keys to accessing every piece of equipment that generates revenue? Is there a secure file somewhere with passwords kept up to date that somebody else could access in an emergency?"

He said broadcasters tend to look at the pieces of hardware they have and ask what needs to be redundant or made reliable. "But more and more, these days, the revenue/underwriting is all traveling on a network link of some sort, monitored and accessed through several net-connected, password-protected, devices — some real, some virtual. More needs to be done to help create that mindset and draw the parallel to brick and mortar, hardware systems that us older folks understand."

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DALE LADNER
Sales Manager
Shively Labs

Shively Labs makes RF components for the FM radio market, so its antennas are the last link in a broadcast chain before the user's signal hits the airwaves.

"It is vital that the products at the end of the chain are cared for and invested in at the same level the studio and transmitter components are," Dale Ladner said.

"As well, the signal that is inserted into the transmission lines needs to be as clean as possible to get best results. Filtering and combining equipment should not be an afterthought in the design process."

He recommended that users think of the system like their vehicle. "If you do not maintain your car, you will have costly repairs and failure down the road. The transmitter and antenna system can be off the air in a heartbeat due to poor installations, old and tired equipment and weather issues." He added that Shively Labs has a 24/7 tech line for emergency support.

When planning an antenna install, Ladner recommended buying a system with a proven track record. Then spend the time and money to get the best installation crew you can afford. Perform yearly inspections of the complete RF components from transmitter to antenna. And if possible connect a remote monitor system so that if a problem starts to affect the RF plant you can shut things down to protect the system.

He listed more questions technical executives should ask: "Does your station have a back-up or auxiliary system that the station can stay on air from if the main station needs to power down or is having technical issues? Do you have a backup engineer that can offer help in an emergency? Does your site have all the engineering details necessary to help the engineer work through a problem; installation drawings, product manuals, basic test gear and a clean operating area? A list of technical support numbers for the products you use."

Finally, Ladner reminds us that Alternative Broadcast Inspection Programs allows radio and TV stations to voluntarily be inspected by an authorized inspector, protecting you from an FCC routine inspection/fines.

Once a station passes inspection, they receive an ABIP certificate that lasts three years. "Should an FCC inspector come to your station for a routine inspection, they will see your certificate and should leave your station. Check with your state broadcast association to see if this is available in your area."

MICHAEL LECLAIR
Chief Engineer
WBUR Boston

When we asked Michael LeClair about airchain continuity, he pointed to Cris Alexander's comments on page 4 in this issue. But he also paused to reflect on the challenges of planning around the people part of such emergencies. He wrote in early April:

Everything at the moment is about figuring out ways to do things from home that keep the staff from having to go to work at a central studio location.

Although all of this is pretty well understood from a technology standpoint, the most difficult part of the task is now handling the human element.

How do you train someone to use equipment when they won't stand in the same room with you? How do you set up a remote site without being able to walk in the door? How do you install new equipment when you can't go to the studios?

Restrictions are becoming tighter every 24 hours, and solutions that worked last week are no longer allowable.

Stations that already had a lot of this infrastructure in place can thank their good fortune to be ready for

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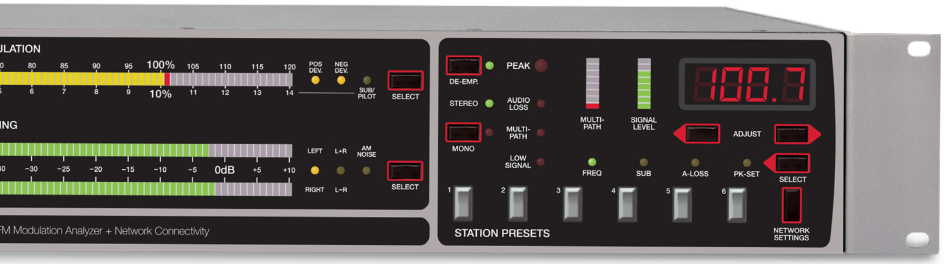

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25 Best Practices to Make You Resilient

An FCC advisory group offers this advice to help you prepare for storms and disasters

This list of best practices was published in March by a working group of the FCC's Communications Security, Reliability and Interoperability Council. Its goal is to help broadcasters identify risks they face before, during and after a natural disaster, and how they can improve or be prepared when their towers or transmission sites are compromised.

1 Broadcasters should do a risk assessment and implement the necessary designs to mitigate power outages.

2 Broadcasters should consider multiple utility power sources when available for both studio and transmitters. Ideally this would consist of two separate utility feeds to the facility, coming in from diverse paths, distinctively separate circuits from the utility company, fed by two separate sub-stations, and switched via an automatic throw-over switch.

3 Broadcasters should consider maintaining backup power generators at both studio and transmitter sites.

a. Determining the load is the key step for the initial design of the system, properly sizing the generator and matching load requirements,

b. Ensure that there is sufficient fuel stored on site to maintain operations for a reasonable duration and have a plan to refuel

c. Ensure the emergency power system is placed correctly.

d. Ensure regular maintenance for the system.

4 Broadcasters should consider dual-power generation systems for mission-critical applications. These solutions provide added redundancy and, depending on configuration, could provide a doubling of run time.

5 Broadcasters should, when possible, have a facility utility power service system (UPS) to keep critical systems operational during the time of a power outage and the emergency power generator coming to speed. Facility UPS systems offer additional benefits including power conditioning to help eliminate surges and spikes that might damage equipment. And, they also temper "dirty switching" from the ATS switching.

6 Broadcasters should take appropriate measures to "harden" the broadcast facilities, studios and transmitter sites, particularly in areas prone to severe weather or natural disasters.

7 Broadcasters should consider the importance of the broadband systems in use, and appropriate measures should be taken to provide alternate ways to access your services in the event of an emergency situation.

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something unprecedented, but I'm confident no one is dealing with a perfect situation, since the onset of this was so rapid. We are fairly happy with our RF plants having dual STLs and transmitters already. I doubt very much that one could easily build out new capacity under the work restrictions that are now common in Massachusetts, so we have to satisfy ourselves that all the existing systems are as ready to go as possible. Attempting to add new equipment is like trying to build the Hoover Dam with a spoon and one hand tied behind your back.

For my two cents, large-market/high-reliability stations must really have two entirely separate RF plants in different locations. Our operations are all news, and we have been willing to spend the extra to keep it as reliable as possible since we are a go-to source in emergencies. It's paying off now. Just keeping my fingers crossed we don't have too many more months of this. ■

Hurricane devastation in Bahamas in 2019.

Getty Images/Jose Jimenez/Stringer

8 Broadcasters should ensure physical security such as a fence augmented by security personnel and/or video surveillance for all sites critical to the broadcast operation.

9 Broadcasters should have a site assessment conducted periodically to identify any structural and/or natural conditions that could pose a threat in the event of a disaster.

10 Broadcasters continuity planning should include all departments within the radio or television station as well as members of local emergency management, first responders, community organizations and utility providers.

11 Broadcasters should identify key suppliers, resources and other businesses they need to interact with on a daily basis. This is especially important for suppliers such as generator service companies and fuel delivery.

12 Broadcasters should hold internal, regularly scheduled drills so that they will be prepared in times of disaster. These drills should then be put into practice with local and state emergency management officials, and local law enforcement as well as employees. These drills should be run at least once a year.

13 Broadcasters should work with station management to create and distribute emergency preparedness information in newsletters, on the company intranet, periodic employee emails, and other internal communications tools.

14 Broadcasters should set up a telephone calling tree, a password-protected page on the company website, and an email alert or a call-in voice recording to communicate with employees in an emergency. Designate an out-of-town phone number where employees can leave a message in a catastrophic disaster. Satellite telephones have proved invaluable in times of emergency.

15 Broadcasters should keep a comprehensive list of nonperishable food supplies as well as water on-premise for time of disaster, keeping in mind that many staff personnel will be on site twenty-four hours a day. It would be advisable to have a minimal five days of supplies. Other non-food items should also be kept in good working order and available if disaster strikes, such as batteries, flashlights, tarps, coolers, cots, inflatable mattresses, blankets/sleeping bags, etc.

16 Broadcasters should ensure they have robust and redundant ways to communicate to external news services and remote news teams, including backup signal feeds to their primary satellite transmit and reception sites.

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17 Broadcasters should reach out to other broadcasters in your area and collaborate with them to create cooperative redundancy and geographic diversity

18 Broadcasters should consider purchasing satellite communications services. Some services are available on-demand. VSAT service is available globally and can be a reasonable solution for your communications needs, including email and other internet services, in an emergency.

19 CSRIC VII recommends that all broadcasters sign up to DIRS [the FCC Disaster Information Reporting System] to allow reporting of operational status of broadcast stations. This will ensure broadcasters a direct form of communication with the federal government and allow them to assess the severity and immediate needs to be able to restore communication to the community more rapidly.

20 CSRIC VII recommends that the FCC work with NAB, other broadcast groups and members of this working group to develop a new Disaster and Preparedness Outline Plan for broadcast stations.

21 CSRIC VII recommends the FCC should consider adding broadcasters as a primary source for the FCC Wireless Priority Service which would help ensure their ability to gather information and distribute it to their communities before, during and after a disaster.

22 CSRIC VII recommends the FCC continue to work closely with DHS and FEMA to provide access letters to help broadcast stations be able to identify themselves as first informers. This will ensure they can get to their transmitter sites and studios to stay on the air and operate their generators, fuel supply, as well as their news staff who can provide crucial information as first informers for the residents of their media market.

23 CSRIC VII recommends the FCC consider the same access letters be granted to wireless providers, cable providers and other groups critical to providing information to their communities.

24 CSRIC VII recommends the FCC to continue to work closely with DHS and FEMA to encourage a working relationship between broadcasters and their local and state emergency management officials.

25 CSRIC VII recommends the FCC encourage social media organizations such as Google, Facebook and Twitter implement algorithms that detect what areas are being impacted by an emergency and prioritize related instructions, impacts, and decision support services to appear at the top of the feeds. ■

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Managing Director, Content Paul J. McLane, *paul.mclane@futurenet.com*, 845-414-6105
Senior Content Producer — Technology Brett Moss, *brett.moss@futurenet.com*
Content Manager Emily M. Reigart, *emily.reigart@futurenet.com*
Technical Advisors Thomas R. McGinley, Doug Irwin
Technical Editor, RWEE W.C. "Cris" Alexander
Content Director — International Marguerite Clark
Contributors: Susan Ashworth, Dave Beasing, John Bisset, James Careless, Ken Deutsch, Mark Durenberger, Charles Fitch, Travis Gilmour, Donna Halper, Craig Johnston, Alan Jurison, Paul Kaminski, John Kean, Peter King, Larry Langford, Mark Lapidus, Jim Peck, Mark Persons, Stephen M. Poole, James O'Neal, Rich Rarey, Jeremy Ruck, John Schneider, Randy Stine, Tom Vernon, Jennifer Waits, Chris Wygal
Production Manager Nicole Schilling
Managing Design Director Nicole Cobban
Senior Design Director Karen Lee

ADVERTISING SALES
Senior Business Director & Publisher, Radio World
John Casey, *john.casey@futurenet.com*, +1-845-678-3839
Publisher, Radio World International
Raffaella Calabrese, *raffaella.calabrese@futurenet.com*, +39-320-891-1938

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