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OCTOBER 2008

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Features

on the cover

Ericsson tower tubes can play a role in reducing electricity consumption at cell sites. They can be sculpted into artistic shapes. See Edmund Wilson's article on page 74 about various ways to make cell sites more green.

Photo courtesy of Ericsson.

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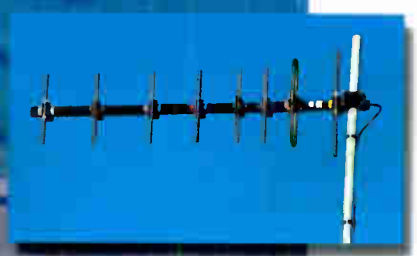

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Yo, buddy … you got a tower?

Recently I had a chance to visit with some friends who fought a fire in the Great Dismal Swamp National Wildlife Refuge between Norfolk, Va., and Elizabeth City, N.C. A good friend of mine, Rachel Sparks, is a communications technician for the Bureau of Land Management in Wyoming. Agencies seem to have a good arrangement to share resources, and she was asked to go to Virginia. When she reached the swamp and began to manage communications from the fire line to ground-base firefighters, it was evident that the location of towers being used would not serve the need.

I don't want to point a finger at the U.S. Department of Interior because they clearly gave the team in the field resources, including the money, to solve the problem, but my friends could not find a willing for-profit corporation that could meet their time, location and, yes, financial requirements. Rachel called me to ask whether I could help her to find a crank-up tower for a short-term rental. I put a feeler out to my friends. Lo and behold, I found that a good radio amateur friend, Tyler Stewart, K3MM, works for Pepco (formerly known as Potomac Electric Power Co.) and has some control over their emergency fleet of resources.

Amazingly enough, Pepco was happy to deploy a 100-foot crank-up tower to help those in need, on very short notice, and for the grand cost of … are you ready … $0.00. This is what, to me, emergency preparedness is all about. Your resources need to be available to you and to those in need on short notice, kept ready and able to be deployed whenever random events require it.

Before the loaner tower, at the height of the fire activity, the firefighters used the Civil Air Patrol to fly the aerial repeater over the fire. That's a good "quick fix," but it is not a long-term, as in many days or weeks, solution. I visited to say hello and see the setup just before everyone was packing up and heading home, so let me show you some photos.

Rachel Sparks, Bureau of Land Management technician, with a Daniels P25 system, used in analog mode.

by Rich Biby, Publisher
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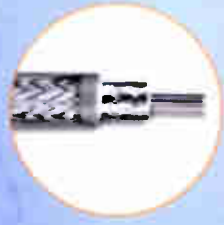

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"Slightly different than the usual herd"

OK, now I'm going to level with you. Amateur radio nerds are a pain in the ass. Yep, spent my early years as a broadcast consulting engineer, as my father is. As part of the elite Washington, D.C.-based engineering crowd, I was trained to dislike the radio amateur community as a known bunch of whiners who only want too much spectrum and as guys who would always ask for something for nothing — such as some tower space, perhaps? And while it is true that a majority of amateurs could not tell the difference between CB bands and a professionally managed 2-meter repeater — and I swear I have not checked into a 2-meter net in 10 years! — there is a lot to be offered by the radio amateur community. Most of the people I run into in my business life as a professional engineer are professionals first, but rabid obsessive amateurs second. The funny thing is that the love of radio seems to drive more and more of their professional activities.

So where is the disconnect? When I worked in Arlington, Va., overlooking the smoldering Pentagon on Sept. 11, 2001 and in days following, I tried to volunteer to provide communications to those working on the rescue efforts at the Pentagon. Within the first few days of a disaster everyone wants to help, but in this case, I'm completely disgusted to say it was all about getting a volunteer badge for hanging on the mantel than it was about actually working for some common good. The fine line between helping and getting in the way had clearly been crossed. I was, at that time, appalled to be associated with that attitude that had come from a few in the radio amateur community.

Recently, however, I've found some lost brothers in a VHF/UHF contest group, K8GP; visit *www.k8gp.net*. My old neighbor and former co-worker, Matt Butcher, originally got me involved with the K8GP guys, and I've begun to realize what amateur radio should be: experimentation, pushing the limits and having a passion for what they don't pay you for. I've seen more technology deployed and developed by people who have no other interest than the love for it than I've ever seen associated with any other group of people. Examples include using Meteor scatter and EME (Earth-Moon-Earth) communications modes, and the basic fact that I can drive a Toyota around the countryside with antennas and transceivers that allow me to operate on all amateur bands through 76 GHz, make me pause and take stock of what radio "amateurs" bring to the party. As it happens, I've been more involved in emergency preparedness as a member of radio amateur groups than I would have ever been as an average citizen.

When I was a radio amateur "CB-er," I became disenchanted with the idea of "amateur" radio. Eventually the repeater group I used to work with dissipated through attrition. A good friend of mine, Dave Jordan, who is the chief information, security and privacy officer for Arlington County, Va., was able to get the repeater frequency reassigned. With his guidance, the Arlington Emergency Operations Center began to provide the support necessary to deliver what appears to me to be one of the country's foremost RACES

(*continued on page 69*)

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Ninth Circuit Court Ruling May Boost Camouflage

Ruling in a lawsuit brought by Sprint Telephony PCS and Cingular Wireless versus San Diego County, Calif., the Ninth Circuit Court of Appeals reversed a seven-year-old ruling of its own and upheld a San Diego ordinance that imposes a layer of requirements for wireless facilities in addition to the zoning requirements for other structures.

"None of the requirements, individually or in combination, prohibits the construction of sufficient facilities to provide wireless services to the County of San Diego," the court's decision reads.

The ruling is expected to allow communities throughout the nine-state region within the court's jurisdiction to tighten their regulation of cell sites if they choose. The effect also may extend more widely because, as the court noted, three other circuit courts of appeal had relied on the Ninth's previous ruling as the basis for their own in cases involving local regulation of wireless towers.

In 2001, the court struck down the ordinance and adopted a standard that barred local governments from adopting any restrictions that "may have the effect of prohibiting" wireless services. In reversing itself, the court concluded that it misread the plain wording of the Telecommunications Act of 1996 when it quoted Section 253(a) of the Act "somewhat inaccurately" by inserting an ellipse ("may ... have the effect") in its citation of the section.

I'll leave it to the legal minds for more about this, but it appears as though the reversal of the court's decision turned in part on *punctuation*.

A portion of the decision describes one of its possible effects:

"On the face of the Ordinance, requiring a certain amount of camouflage, modest setbacks, and maintenance of the facility are reasonable and responsible conditions for the construction of wireless facilities, not an effective prohibition.

"That is not to say, of course, that a plaintiff could never succeed in a facial challenge. If an ordinance required, for instance, that all facilities be underground and the plaintiff introduced evidence that, to operate, wireless facilities must be above ground, the ordinance would effectively prohibit it from providing services. Or, if an ordinance mandated that no wireless facilities be located within one mile of a road, a plaintiff could show that, because of the number and location of roads, the rule constituted an effective prohibition. We have held previously that rules effecting a 'significant gap' in service coverage could amount to an effective prohibition, *MetroPCS*, 400 F.3d at 731-35, and we have no reason to question that holding today."

San Diego County wanted to prohibit non-camouflaged poles in residential and rural zones and generally disallow more than three collocations per site. It wanted to impose various aesthetic and maintenance requirements.

To the extent that similar ordinances are adopted by other jurisdictions, companies offering camouflage, landscaping and even graffiti removal may be among the beneficiaries of the ruling. agl

by Don Bishop, Exec. Editor
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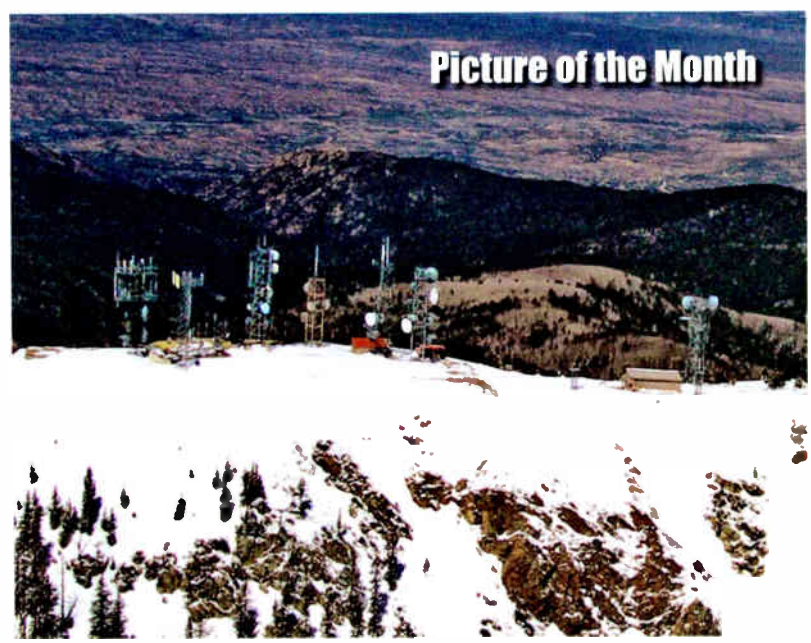
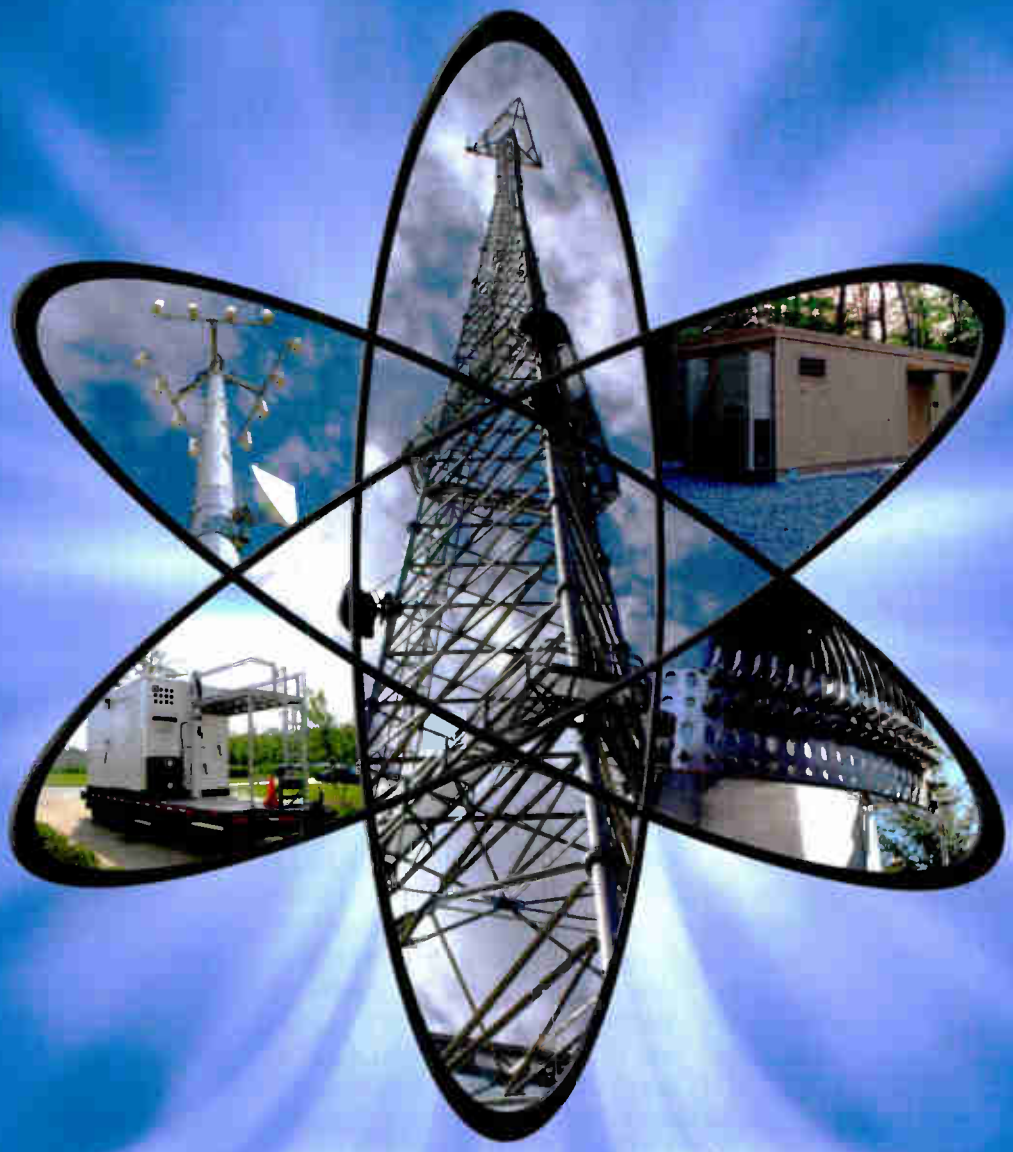


Topping Tesque Peak in Santa Fe County, N.M., a telecommunications site operated by Tesque Radio of Laguna Hills, Calif., boasts antennas for cellular, two-way radio, paging and microwave relay systems. An 80 KVA propane generator supplies auxiliary power.

The Nucleus of Your Site



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Update: Will OMB Back Up FCC on Emergency Power?

– by Mike Saperstein –

As previously reported in this column, the legal battle over the Federal Communications Commission's backup power rule continues to take odd legal twists and turns. PCIA and the DAS Forum both intervened in litigation challenging the rule earlier this year. In addition, PCIA and the DAS Forum are preparing members and the industry at large for the various scenarios in play with respect to the rule, and regarding the larger question of wireless facility operations in emergencies.

On July 8, 2008, the U.S. Court of Appeals for the D.C. Circuit declined to decide on the merits of the FCC order, which requires 24 hours of backup power at all central hub facilities and eight hours of backup power at all wireless facilities, including all DAS nodes. Instead, the court decided that the FCC's failure to send the order to the Office of Management and Budget (OMB) for review of the order's Paperwork Reduction Act (PRA) elements makes the case unripe for review.

Under the PRA, OMB is required to review any agency decision to collect information from the public. This function is rarely contentious, and in fact, the OMB's decision is not even binding on the FCC. As an independent agency, the FCC can reject some or all of OMB's analysis of the paperwork burden should it choose to do so. In most instances, OMB approval is a minor formality. In this instance, though, OMB's decision could play an integral role in the future of the rule.

The court's February 2008 decision to put a "stay" on the FCC's backup power order indicated that the parties challenging the order had a good chance of success on the merits of the case. After informal consultation between the FCC and OMB, the FCC decided not to move forward with the OMB review. In its July decision, the court held that the FCC's decision to delay OMB review was unlawful, as the FCC is required to continue with this review regardless of the order's status with the court. The FCC's failure to consult with OMB is particularly glaring because, in an unorthodox move, the order's effectiveness is specifically conditioned on publication in the Federal Register that OMB has approved the order's information collection elements. Because this never happened, the order in its current state never actually went into effect.

The section of the order OMB will review is of great significance to the overall order. The FCC required providers to submit lists of all assets within six months of the effective date of the order. Each asset must be categorized as compliant, noncompliant but exempted, or noncompliant with an attached plan to ensure compliance. This requirement and the minute amount of time the FCC estimated it would take to complete it already drew significant criticism in public comment before the FCC. When OMB receives the order for review, it will then put these PRA elements out for public comment for 30 days.

In an interesting coincidence, OMB

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took the rare step of rejecting the FCC information collection provision under the PRA in a completely unrelated case on July 9, 2008, the day following the court's decision in the backup power order. PCIA and the DAS Forum intend to actively protest the order's complex and burdensome reporting requirements to encourage OMB to reject the backup power order as well.

The Office of Management and Budget's decision could play an integral role in the future of the backup power rule

At press time, however, the futures of the challenges, and indeed the content of the order itself, are very much in limbo. The FCC has not submitted the order to OMB. If the FCC submits the order to OMB for approval, the OMB could take one of three possible courses of action. First, the OMB could find significant inconsistencies between the FCC's estimation of administrative burden and the industry's estimation of administrative burden. OMB would then return the order to the FCC to fix the problematic portions of the order. The FCC could also use this as an opportunity to rework other problematic components of the order; this action would initiate a new proceeding and comment cycle on a revised order. Alternatively, the OMB could approve the order in its current form. Finally, the FCC could reject OMB's analysis outright. In either of these two cases, it is likely that the appellants would reinstate their challenge of the order. This would set the stage for a new round of oral arguments.

PCIA and the DAS Forum are avidly monitoring the developments in this case for their effect on wireless service provision and wireless infrastructure. The most recent developments in this case also provide another opportunity for us to articulate why the order fails to achieve the stated goal of ensuring continuity of wireless facilities operations in emergencies.

Regardless of the FCC's backup power order, power continuity considerations continue to be a critical element of all future wireless site development. This fact makes the "Power Lunch" at this month's 2008 Wireless Infrastructure Show in Hollywood, Fla. all the more important to your wireless infrastructure operations. During this session, industry leaders will discuss best practices for backup power in light of the current regulatory mandates and market realities. For more information on the 2008 Wireless Infrastructure Show, please visit *www.pcia.com*.

Please join us in our advocacy efforts by contacting the PCIA Government Affairs team at 703-739-0300 with any questions, concerns or updates. **agl**

Mike Saperstein is a public policy analyst with PCIA.

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Pole Attachments Regulatory Reform Continues

by Jacqueline McCarthy

Regulatory activity at all levels of government has brought issues affecting DAS to the forefront, and the DAS Forum has seized every opportunity to pursue policies that promote the development of wireless infrastructure generally. In particular, many regulatory authorities are currently reviewing pole attachment procedures in an effort to strike a balance between pole owners' safety and process concerns and wireless attachers' need for space on this valuable "vertical real estate."

The FCC's recent pole attachment rulemaking requested a broad category of information regarding how poles are used by wireless attachers, and what challenges occur with such use for both pole owners and the wireless infrastructure providers that seek to attach to poles. To date, more than 60 parties have commented in this proceeding, and viewpoints have been given from the utility, cable, wireline and wireless industries. The DAS Forum's comments focused on the importance of equitable and fair access to poles for the deployment of wireless infrastructure and noted the challenges many of our members face when developing wireless network on poles. We urged the FCC to use its influence to ensure that pole attachment procedures effectively support the broad societal benefits of ubiquitous networks. In addition, we advocated for a reasonable cost-based rate structure to provide cost certainty to infrastructure providers.

Similarly, the DAS Forum and its members are pursuing more equitable pole attachment access in some of the 20 certified states with their own regulatory schemes. In Connecticut, the Department of Public Utility Control opened a docket in June at the request of PCIA and the DAS Forum to investigate access, make-ready conditions and rates for wireless attachments to utility poles. We support our members' efforts before the California Public Utilities Commission (CPUC) to confirm the safety of wireless attachments according to applicable California regulations, and to enact policies that support the use of poles as a platform for much-needed wireless facilities. The CPUC's final rules regarding separation of wireless pole attachments from utility infrastructure are expected this fall. We also welcome the opportunity to engage with the Vermont Department of Public Service as it reviews safety and engineering standards for wireless pole attachments.

Allen Dixon, president of the DAS Forum, welcomed attendees and offered opening remarks at the DAS-in Action event in Washington, D.C.

Our DAS-in-Action event in June was an effective gathering of policymakers and wireless industry professionals. It included timely programming on pole attachment and other regulatory issues. This event, held in Washington, D.C., also included an illustrative case study and site visit sponsored by NewPath Networks, a DAS Forum member with a network in suburban Gaithersburg, Md. Angela Giancarlo, chief advisor to FCC Commissioner Robert McDowell, emphasized the importance of DAS as a component of wireless infrastructure and applauded the work of DAS Forum members in achieving a technologically innovative solution to infrastructure challenges.

Please stay tuned for future DAS-in-Action events across the country. For more information about the DAS Forum, please visit *www.thedasforum.org*. agl

Jacqueline McCarthy is director of government affairs at PCIA — The Wireless Infrastructure Association, Alexandria, Va.

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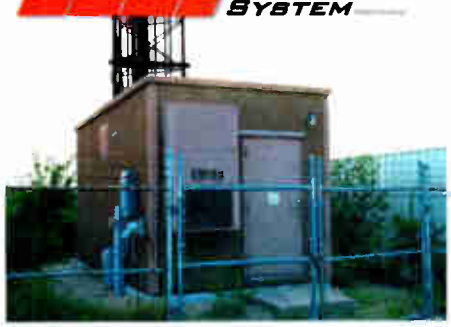

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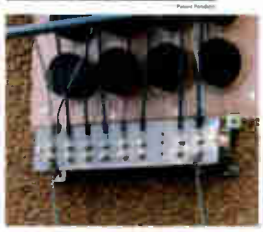

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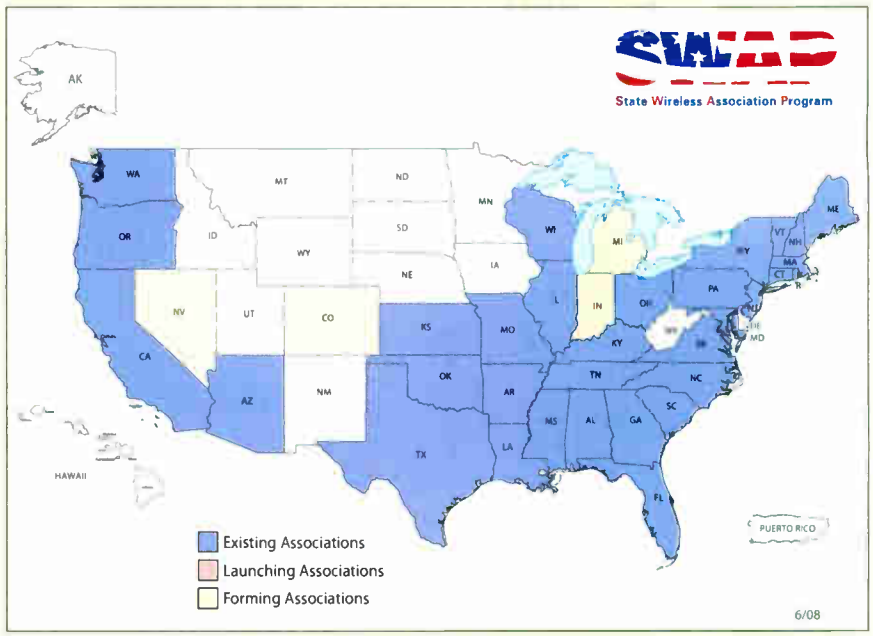
SWAP National Sponsorship Program

by Nancy Chrisman

While traveling the country in support of the State Wireless Association Program, I continue to search for ways in which PCIA can better support the individual state wireless associations in carrying out their missions and enhance the value of the national program to their members. In so doing, I have been approached by a number of our national member companies to consider establishing a national sponsorship program for SWAP.



These major companies want to offer their financial support to each state association but find that the administrative paperwork that they encounter in supporting 22 individual state wireless events each quarter, or 88 times a year, can be somewhat burdensome. Instead, they would prefer to strike one check a year with the monies divided evenly among the state associations. State associations rallied around this idea, and thus was born the SWAP National Sponsorship Program.

[Major companies] would prefer to strike one check a year with the monies divided evenly among the state associations

In addition to enjoying a streamlined accounting process, SWAP national sponsors are recognized at each quarterly event by having their company name and logo displayed. They are identified on each association website via a banner ad on the home page. They receive a complimentary hole sponsorship at state wireless association golf events. The national sponsors gain branding exposure through PCIA's national SWAP website and PCIA's SWAP promotions throughout the year.

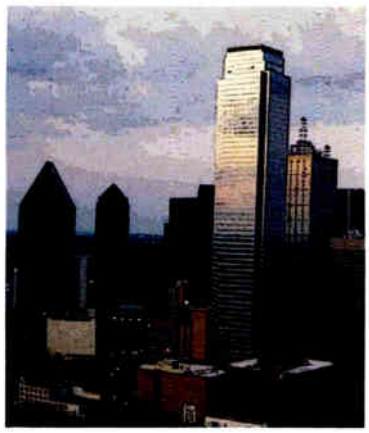
In turn, the individual state wireless associations enjoy greater access to more potential sponsors through PCIA's marketing efforts and better help the needs of their larger member companies by providing a forum for national sponsorship. Individual state wireless associations will also be better able to forecast their annual budget requirements. They will have the ability to focus more on the content of their offerings versus the financial burdens of organizing each event, and — perhaps most importantly — they will have the ability to strengthen their associations by attracting a more diverse membership base.

PCIA is delighted to be able to offer this new program to build, strengthen and enhance the national SWAP program. We look forward to working with all of the companies that have expressed an interest in becoming national sponsors. If you would like more information on SWAP or would like to become a SWAP National Sponsor, please contact me. **agl**

Nancy Chrisman is director of membership and SWAP at PCIA — The Wireless Infrastructure Association. Her email address is nancy.chrisman@pcia.com.

Texas State Wireless Association

by Jeff Peters, president



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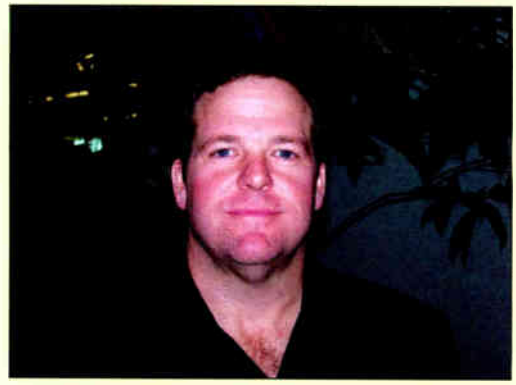
The Texas State Wireless Association formed in early 2006 and launched with our first general meeting in October of that year with more than 285 members in attendance. Since our launch we have enjoyed incredible participation and results in our efforts to grow our association into the unified voice of the wireless industry in Texas. We have many people to thank for our success, including excellent support from PCIA, wireless carriers, tower owners, equipment and service providers, and the commitment of our board and active membership.

Shortly after our launch, we began incorporating educational sessions for our membership as part of our quarterly business meetings. Our first session focused on the changing structural engineering requirements of Rev G. We were fortunate to assemble a panel of experts, including Brian Reese of AeroSolutions, Mark Malouf of MEI and Rocky Norman of CFE Telecom, to help our membership understand the upcoming changes to the structural code. Subsequently, we have held sessions on environmental issues, WiMAX and community involvement.

Charitable endeavors have been a primary focus of the Texas State Wireless Association since its inception. Due to the support of our members' philanthropic efforts, earlier this year we officially formed the Texas State Wireless Association Foundation, a nonprofit corporation that administers our charitable efforts. To date, the Texas State Wireless Association has distributed more than $100,000 to a multitude of charities including the TXWA Keith Harris Scholarship Fund, Kidd's Kids, Children's Medical Center of Dallas, the American Foundation for Suicide Prevention, Toys for Tots and several community day care centers throughout Texas. We are continually overwhelmed and humbled by the generosity and commitment of our membership and sponsor companies that make our charitable efforts possible.

The Texas State Wireless Association expects to continue to grow in our service to our membership and our community. I am honored to be involved and cannot thank enough the people who make our association a success. The tireless work of our board and committee members, the SWAP Executive Committee, PCIA, *AGL* magazine, our neighboring associations, our sponsoring companies and the enthusiastic participation of our membership all play a vital role in the development and continuing success of the Texas State Wireless Association. **agl**



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How to Choose the Right Indemnity Clause

by David Saul, AAI

Understanding your business's risk exposures is the cornerstone to managing them. Whether your business relies on outside vendors to provide goods and services or you're a provider of goods and services to your clients, such as a landlord-tenant, you should be aware of how to take contractual precautions to protect your business against potential losses or damages. An indemnity agreement secured by an additional insured endorsement is a risk-transfer tool that can help insulate your business from potential risks.

It is a common practice to enter into contractual agreements with those involved in a project to formalize the terms and responsibilities for all parties. These contracts often include an indemnity agreement, also known as a hold-harmless agreement, as a means to transfer the risk of future losses or damages from one party to another. As mentioned in my prior article "Risk Transfer for Site Owners," a tower owner loses significant control when entering into a landlord-tenant relationship.

Contracts typically contain three kinds of indemnity or hold-harmless clauses.

Limited — obligates the indemnitor (the party paying compensation) to hold harmless the indemnitee (the party receiving compensation) only for the indemnitor's own negligence.

Intermediate — obligates the indemnitor to hold harmless the indemnitee for all liability except that which arises out of the indemnitee's sole negligence.

Broad form — obligates the indemnitor to hold harmless for all liabilities, including the indemnitee's negligence.

To support the terms of the indemnity agreement, the contract will often include insurance requirements. These spell out the insurance required by the various parties entering into the contract. It is common for one party to include another as an additional insured under its Commercial General Liability (CGL) policy. For example, owners or general contractors of construction projects commonly require those who are actively involved in the project operations, such as subcontractors, to sign a contract and name them as an additional insured on their CGL policy to limit their liability for damages caused by the subcontractor.

Carefully review the indemnity agreement prior to finalizing the contract to determine the extent of your company's liability. Once the scope is understood, you may want to negotiate the terms to limit your exposure. The application and enforcement of an indemnification agreement does, however, depend upon the statutory and common law of the jurisdiction in which enforcement is sought.

Additional-insured status

When reviewing the insurance requirements section of a contract, pay particular attention to the "additional-insured" requirements. There are numerous additional-insured endorsements. The specific additional-insured endorsement, required in the contract, must be reviewed to determine the scope of coverage. Contact your insurance agent to obtain sample endorsement wording.

The Insurance Services Office released new additional-insured endorsements in 2004. The intent of the endorsements is to provide liability coverage for additional insureds (typically the general contractor or project owner) with respect to damages caused by the named insured (subcontractor). The endorsements do not provide coverage for the additional insured's sole negligence, but they can provide coverage for the additional insured's contributory negligence. Make sure that the actual additional-insured endorsement satisfies contract requirements.

What's in a name?

Don't be confused — additional-insured coverage is different from "additional-named-insured" coverage. An additional named insured usually is an affiliate of the primary insured. You will not be able to add or be added as an additional named insured. If this is part of the contract, it should be removed.

Tenant/landlord concerns

In concert with the additional insured requirement, the landlord should require that it be named as an additional insured, making this a primary condition within the lease terms. This will help you to further accomplish the risk-transfer mechanism. Now the landlord has two CGL policies available that can respond in the event of a loss: the tenant's policy and the landlord's own policy. If a claim were to arise, how would each of the policies respond? Without primary language, both policies would be likely to contribute equally. If the tenant's policy were primary, its CGL policy would pay first until its limits are exhausted. Only then would the landlord's policy respond.

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It is vital that the landlord have a system in place to obtain and review certificates of insurance. If your company's size prevents the review process, seek help from your insurance agent. Additionally, a qualified real estate attorney should review leases and subcontract agreements on a periodic basis.

Additional insured

Being an additional insured should be used to strengthen the underlying lease or other business contract. However, this risk transfer method is not a remedy for all potential claims. The requirement of additional-insured status is not a substitute for the accurate drafting of hold-harmless clauses.

Understanding your coverage

Understanding the terms of the contract, the extent of liability assumed in the indemnity agreement and the insurance requirements — including the coverage provided or afforded by the additional-insured endorsement — are critical to minimizing future liabilities and exposure to losses.

Keep in mind, the liability assumed in the indemnification agreement of the contract can be broader than the coverage provided under the additional-insured endorsement. A comparison of the two should be done to determine what is covered by insurance and what is not.

A certificate of insurance is at best an imperfect means for a certificate holder to obtain assurance that the policies set out in the certificate have, in fact, been issued and that the party providing the certificate has fulfilled the insurance requirements set out in the contracts. This is particularly true with regard to key requirements such as providing the certificate holder with additional-insured status. The standard Agent-Company Organization for Research and Development (ACORD) certificate leaves a potential for gaps in coverage due to the disclaimers contained in it, that is, that neither the certificate nor the contract pursuant to which it is issued modifies the terms of the actual policy. Where the certificate contains these disclaimers, it is highly unlikely that a court would incorporate the terms of the certificate into the insurance policy.

Many businesses choose to transfer or accept risk through contracts, purchase orders and lease agreements. However, not all contracts or endorsements are created equal. Again, contact your insurance agent to learn more about contractual risk transfer and how it can be a part of your overall risk-management program. **agl**

David Saul is executive vice president of Atlantic Risk Management, Columbia, Md. and an accredited risk advisor in insurance (AAI). His email address is: *dsaul@atlanticrisk.com*.

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in Kansas and Missouri
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SBA Communications Corporation

Harbor Wireless, LLC
has conveyed certain 700 MHz licenses representing approximately
11,700,000 pops
to
AT&T Mobility II LLC

Capitol Broadcasting Inc.
has conveyed certain 700 MHz licenses representing approximately
4,800,000 pops
to
AT&T Mobility II LLC

Vertex Towers
has conveyed the assets comprising
2 Towers
in Texas
to
Skyway Towers

Windstream Corporation
has conveyed certain 700 MHz licenses representing approximately
1,100,000 pops
to
AT&T Mobility II LLC

Whidbey Telephone
has conveyed certain 700 MHz licenses in ME & NH representing approximately
1,000,000 pops
to
United States Cellular Corporation

Whidbey Telephone
has conveyed certain 700 MHz licenses in Alaska representing approximately
279,000 pops
to
MTA Communications, Inc.

Sterling Communications, Inc.
has conveyed 100% of the stock of the Company including
18 Towers
in Kansas, Oklahoma and Texas
to
SBA Communications Corporation

Evergreen Towers, LLC
has conveyed 100% of the membership unit interests of the Company including
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Advanced DAS Could Aid Femto's Enterprise Debut

by Marc Kaeumle

The much-lauded femtocell could make the transition from domestic homes to larger scale commercial in-building coverage applications by teaming up with advanced distributed antenna systems. Advanced passive and active DAS architectures are fast evolving into forms that could ultimately assist femtocell technology to overcome its mid-to-large enterprise challenges, allowing femtocells to play a role in the corporate in-building world.

The femtocell is an exciting domestic coverage technology, particularly as we start to see more affordable consumer-level units. It is destined to play an immediate and powerful role in ensuring that the premium data throughput of HSDPA-, WiMAX- and LTE-based services needed to provide broadband wireless data applications will soon be achieved deep within our homes. In applying it to larger premises, the femtocell potentially presents enormous "scaling" advantages, as each femtocell brings with it a finite unit of both coverage and network capacity. This makes it an immensely scalable RF technology.

Although the femtocell does offer such theoretical scaling advantages, multi-femtocell networks deployed over larger corporate premises currently face three practical application challenges: core network connectivity (backhaul), network operation and management, and handover and signal "spillage" issues.

The first of these — establishing the link between base transmitter station (BTS) and the access gateway — presents a complex challenge, particularly when contemplated over hundreds of femtocells that might be required in a corporate campus. In conventional macro-cellular systems, the BTS-to-RNC link is supported over private high-capacity links. This approach isn't commercially viable for a network comprising a multiplicity of femtocells, so less-costly compromises, such as using the public Internet to realize "femto-to-core-network" connectivity, have to be considered.

Equally challenging are the issues of cell-to-cell handover, and network operations and management. A network comprising hundreds of active femtocells will demand elaborate active unit monitoring and alarming, plus complex handover procedures. The challenge with femtocell handover in a multi-cell architecture is that the small cell size dramatically escalates the rate of cell handover events per cell when compared with conventional outdoor cell systems. As a result, the handover network burden is predicted to be very high indeed in multi-cell femtocell networks.

Similarly, signal "spillage" outside of the premises' boundary will tend to occur, due to the femtocell's inherently fixed "omni" RF distribution pattern. This will inevitably result in an increase in unauthorized femtocell access attempts by external callers inadvertently passing through the "spillage area," resulting in a "ping-pong" effect — whereby call access is attempted and subsequently rejected — that will further burden the network.

Today's active DAS topologies are bringing enormous functionality and benefits to the in-building domain. Most obvious is the shaped and sculptured RF coverage pattern they offer, which minimizes spillage and maximizes in-building signal strength. In addition, the systems are driven from a central BTS or NodeB, overcoming handover issues. Also, advanced active DAS systems are capable of efficiently extending network coverage far from the BTS or NodeB, using technologies such as RF-over-fiber, and other exciting transport mechanisms.

Furthermore, pairing the femtocell with an active DAS system goes a long way toward solving many of these femtocell application problems. In business-style femtocell applications, the advanced active DAS system can act as a coverage booster to the core-placed femtocell base station. In such applications, the active DAS can boost or extend the coverage of the femtocell, thus meaning that fewer femtocells — in terms of total cell count — are required for any given space. This overcomes many of the femtocell's current consumer problems. It's important to note the inherent coverage flexibility and scalability benefits of the active DAS, particularly when compared with conventional distributed base station architectures. In extreme cases, we could see the femtocell as a pure capacity provider, and the DAS as the coverage distribution medium — a perfect pair.

Combining the femtocell with an active DAS will bridge the domestic-to-corporate gap for femtocell technology, ultimately seeing it play an effective role in larger corporate wireless data applications. Advanced active DAS technologies will help overcome the shortfalls that the femtocell currently experiences outside of the domestic environment. Quite frankly, the two technologies could pair to form powerful combinations for future in-building solutions. agl

Marc Kaeumle is vice president for Wireless Indoor Solutions at Radio Frequency Systems.

FCC Considering Next Steps on Migratory Birds

by William Sill

With the urging of the United States Court of Appeals for the District of Columbia Circuit to "proceed with dispatch," the Federal Communications Commission is pondering how best to resolve the migratory bird issues raised in the court's February 2008 remand order. PCIA has been active in focusing the FCC's attention on the remand issues and in suggesting concrete steps that could be taken to meet the court's mandate.

The court vacated and remanded the FCC's dismissal of a petition filed by the American Bird Conservancy (ABC) and the Forest Conservation Council. The petition requested that the FCC assess the impact of about 5,900 towers in the Gulf Coast region on migratory birds and for the FCC to consider migratory bird issues during the tower registration process. The court sent the case back to the FCC with instructions to expeditiously develop an antenna system registration (ASR) public notice procedure that would give the public an opportunity to comment on ASR applications prior to their grant; to prepare a programmatic environmental assessment (EA) for the impact of towers on the Gulf Coast region; and to adequately describe the basis upon which the FCC will engage in programmatic consultation with the United States Fish and Wildlife Service (USFWS) on migratory birds. For reference, see the article "Federal Court to FCC: Reconsider Migratory Birds" in the May 2008 issue on page 32.

Modifying ASR procedures

On May 2, the Infrastructure Coalition, a wireless industry coalition consisting of PCIA – The Wireless Infrastructure Association, CTIA – The Wireless Association, the National Association of Broadcasters and the National Association of Tower Erectors, filed a *Petition for Expedited Rulemaking* (*Rulemaking Petition*) requesting that the FCC initiate a proceeding to develop a public notice procedure for the ASR program. The Infrastructure Coalition provided a detailed public notice process designed to meet the court's mandate.

Infrastructure Coalition

PCIA – The Wireless Infrastructure Association
CTIA – The Wireless Aszsociation
National Association of Broadcasters
National Association of Tower Erectors

The Infrastructure Coalition petitioned the FCC to develop a public notice procedure for antenna system registration. The FCC issued a public notice inviting comments. By the end of May, the following parties submitted comments favoring an expedited public notice period that would produce a uniform and finite process:

Crown Castle
American Tower
Verizon Wireless
APCO

Avian Commenters

American Bird Conservancy
Defenders of Wildlife
National Audubon Society

The Avian Commenters want a public notice process that would require the FCC to:

1. Solicit USFWS input prior to the FCC acting on ASR applications
2. Issue draft decisions on each ASR, which would be subject to a public notice period
3. Implement a rule that would automatically deny ASR applications that are not acted on by the FCC within a settime frame regardless of the reason for the delay

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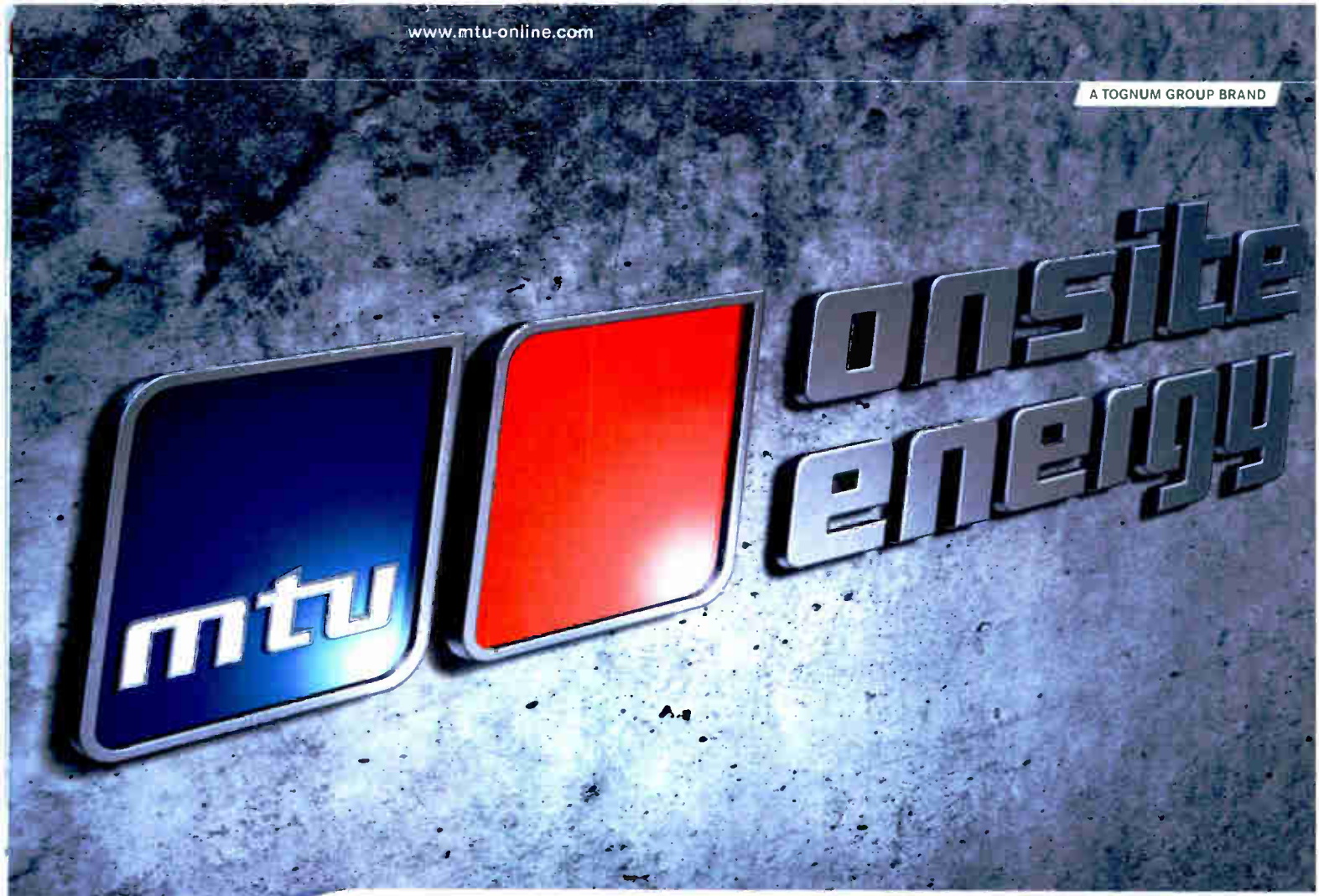

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In response, the FCC quickly issued a public notice inviting comment on the *Rulemaking Petition*. Ten comments were filed by the end of May, including comments from Crown Castle, American Tower, Verizon Wireless and the Association of Public-Safety Communications Officials-International, and a joint comment filed by ABC, the Defenders of Wildlife and the National Audubon Society (Avian Commenters). With the exception of the Avian Commenters, all commenting parties favored an expedited public notice period that would produce a uniform and finite process. In contrast, the Avian Commenters suggested the adoption of a burdensome and open-ended public notice process that would require the FCC to: 1) solicit USFWS input prior to the FCC acting on ASR applications; 2) issue draft decisions on each ASR, which would be subject to a public notice period; and 3) implement a rule that would automatically deny ASR applications that are not acted on by the FCC within a set time frame regardless of the reason for the delay.

Although many, including the wireless industry, were hopeful that the FCC would have already issued a Notice of Proposed Rulemaking (NPRM) on the *Rulemaking Petition*, the FCC is still considering its next move. To register the concern of its members, the Infrastructure Coalition met with the FCC staff on June 17 and July 9 "to encourage the agency to move quickly" as all parties commenting on the *Rulemaking Petition* agreed that an "expedited rulemaking is warranted." The Avian Commenters also met with the FCC staff in June to request that the FCC act on the remand.

Although the court's remand order implied that developing a public notice procedure should be simple to design, in practice, designing and implementing a public notice process is far from simple. The task is complicated by the fact that it will have to be integrated not only into the licensing process and electronic database of the FCC's Wireless Telecommunications Bureau (WTB) but also for the Mass Media Bureau (MMB). Furthermore, it will have to accommodate licensing procedures for both site-based and geographic area-licensed facilities. Working out the details will involve focusing the resources of WTB, MMB, the FCC's Office of General Counsel and the commissioners' offices. This need for intra-agency coordination may have been made more difficult by the fact that several other high-profile items, such as the XM-Sirius merger and the 700 MHz D-block proceeding, were depleting the FCC's resources.

Other remand issues

Although the court thought that establishing a new public notice

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procedure would be a "simple matter," it did not make similar statements concerning the remaining remand issues such as preparing a programmatic EA for the Gulf Coast region and describing the circumstances under which the FCC will consult with the USFWS. In addition, the Avian Commenters acknowledged that preparing a programmatic EA would take longer than implementing a public notice process. Therefore, the Court would likely be satisfied in the short term with evidence that the FCC has begun tackling the remaining remand issues.

PCIA, as part of the Infrastructure Coalition, filed a letter with the FCC on May 9, providing a road map detailing how the FCC could meet these objectives. Specifically, the Infrastructure Coalition urged the FCC to commence the preparation of a programmatic EA "to study the cumulative effects on migratory birds of 'reasonably foreseeable' future ASRs in the Gulf Coast region, taking into account existing ASRs to establish a baseline to be utilized when determining such future effects."

On consulting with USFWS, the Infrastructure Coalition suggested that the FCC simply go ahead and consider whether programmatic consultation is necessary as part of the programmatic EA rather than try to explain the "myriad factual circumstances under which programmatic consultation would be required." The Infrastructure Coalition stated, "Only if the FCC makes an affirmative finding that the cumulative impact of its ASR program in the Gulf 'may affect' listed birds should the agency then initiate programmatic consultation with FWS."

While the Avian Commenters promised in their May 27 Joint Comment to subsequently file a petition for rulemaking aimed at broadly addressing these other remand issues, no petition appears to have been filed as of the time this article goes to press.

Uncertain road ahead

Even though responding to the court is no easy task, it is essential that the FCC move forward quickly. Hopefully, the FCC will soon issue an NPRM with a truncated comment period, so that the FCC can quickly review comments and release a decision containing final rules that would establish a public notice process. If the FCC does not act in the near term, the agency risks having to explain why it has not acted expeditiously. agl

William Sill is a partner in the law firm of Wilkinson Barker Knauer. He chairs the firm's Tower Group, and his email address is *wsill@wbklaw.com*. William Layton, another partner in the firm, contributed to the article.

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Backup Power Generation for Cell Sites, Central Offices

As telecommunications providers implement power solutions at cell sites and central offices, all aspects of the generator and battery implementation need to be considered. Today's market demands network reliability and cost-effectiveness.

by Mike Kirchner

In a post 9/11 and Hurricane Katrina America, disaster preparedness has entered our social consciousness more than ever before. The events of recent years have prompted us to question the reliability of our society's infrastructures with particular focus on communications and power. Images of these events have pierced our psyches and fueled our fears, calling us to action. One such action was the Federal Communications Commission's issuance of an order that requires eight hours of emergency backup power for cell sites and 24 hours for central office locations. Whether or not you agree with the order, our society's reliance on mobile communications will continue to drive federal oversight into wireless carriers' emergency capabilities.

In today's market, the vast majority of cellular sites do not use an on-site generator to sustain operations during an extended electrical power interruption. Most of these sites are instead backed up with batteries providing two hours of run time. Though battery systems are necessary to provide protection against short-term power outages, they become an increasingly expensive option when extended operation is required. When implementing extended operation, batteries tend to cost five to 10 times more than installing a generator when costs are analyzed for a 20-year period. The result of the FCC requiring eight hours of backup power functionally means that a generator will need to be added to nearly all sites, with some exceptions. The focus of the following information is to explore some of the factors to consider when applying generator power to cell sites and central office applications. The idea is to better educate telecommunications professionals about the options available as the need for backup generation continues to be a critical business necessity.

Generator size

The size of the generator varies with the applications loads. Most cell sites that use a three-cabinet configuration typically use a 20- to 35-kilowatt generator. Sites using an equipment shelter will typically use a 30- to 60-kilowatt generator. Collocation sites bring an interesting set of questions relative to adding backup generation. A single, larger generator could provide backup power to the entire site but this brings into question issues of ownership, system reliability and maintenance. Currently, most sites do not share generator power, but market pressures for space and cost may spur increased cooperation among all parties at collocation sites.

Collocation sites bring an interesting set of questions relative to adding backup generation

As a generator is integrated into a cellular site, the amount of battery capacity needed at the site can be significantly reduced. Sizing the on-site batteries is largely affected by the carrier's operational philosophy. If the operating philosophy is to maximize network reliability, batteries with capacities of two to four hours might be utilized. If the operating philosophy were to minimize operational costs while maintaining adequate site reliability, the batteries would be sized for 15 to 30 minutes of operating time. Given the extremely competitive nature of the cellular industry, configurations with limited battery capacity ultimately will be more common.

Fuel choices

Within the cellular market today, generator fuel choices include diesel, natural gas and liquid propane, with diesel being the most common. The preference for diesel by some carriers is driven by a limitation of on-site natural gas and crisis-management philosophies. For sites without a natural gas infrastructure, liquid propane and diesel are the only choices. From a crisis-management standpoint, some carriers feel they could better deal with bringing diesel to a site rather than dealing with a failed natural gas infrastructure or refueling with liquid propane.

Because the cellular market continues to be highly competitive, the desired comfort level with bringing diesel in ultimately may be overridden by other

market forces such as capital costs, fuel costs, fuel maintenance costs, environmental concerns, fuel reliability and the risk of running out of fuel.

Diesel

Diesel configurations are the most common cell-site configurations, but they are not without challenges. Diesel engines are more expensive than the corresponding natural gas and liquid propane configurations used at cellular sites. Diesel is also a more expensive fuel that requires an initial capital cost to fill the tank and ongoing costs to maintain the fuel. Though they are in wide use, diesel generators are significantly challenged by major electrical power interruptions that cripple infrastructure and make refueling problematic or nearly impossible. Hurricanes and storms often close roads. Grid failures may make it impossible for suppliers to pump fuel into delivery trucks. These realities often place system designers in a difficult position. How much diesel fuel storage is enough and how much is too much? Large fuel tanks bring unique challenges with regard to fuel contamination and breakdown.

The two most common contaminants are water and biomass. Here's what happens: Water enters the tank as water vapor in humid air through the tank's normal vent and condenses during the daily thermal cycle. Initially, moisture binders in the fuel capture and contain the moisture. As these binders become overloaded, the water drops to the bottom of the tank and begins accumulating. At some point, the moisture may be sucked into the diesel engine, potentially resulting in loss of power, loss of lubrication and corrosion.

Water also creates an environment that will support biomass that can grow at the water/fuel interface. When these microbes are pulled into the engine, they cause the fuel filter to clog, resulting in the engine losing power and shutting down. Contamination in general is a problem that can be treated with additives and a watchful scheduled maintenance program. Additives are helpful in treating common fuel breakdown issues. These additives include varnishing and the formation of gums. Though additives are helpful, at some point the fuel may need aggressive filtering and treatment requiring that it be cycled out of the storage tank.

Spark-ignited fuel

Spark-ignited natural gas generators offer some advantages compared with diesel solutions. The most noticeable advantage is the extended run time offered by an endless supply of natural gas. Other advantages include no fuel permitting requirements, reduced scheduled maintenance costs, less risk of environmental contamination and cleaner engine emissions.

Though natural gas-fueled products offer unique run time advantages, they do rely on natural gas distribution systems to deliver the fuel, which means the gas utility would be providing backup for the electric utility. Is this acceptable? For nonearthquake environments, the natural gas infrastructure has shown itself to be extremely reliable and not interdependent with the electric utility.

For sites that want the added comfort of on-site fuel, often spark-ignited generators use liquid propane as an on-site fuel choice. These systems can be designed to run in a dual-fuel configuration in which the primary fuel is natural gas and the secondary fuel is liquid propane. Though liquid propane backup provides additional advantages, it also comes with the space cost of the fuel tank. To deal with this constraint, some suppliers have developed configurations that place a liquid propane tank underneath the generator similar to a sub-base diesel configuration.

Maintenance

Scheduled maintenance is a critical element of generator reliability. Within

Central Office Example

Current typical operation load: 500 kW
Current calculated dark-office peak load: 1,000 kW
Expected load growth of 250 kW (typical) / 500 kW (dark-office)
Note: Dark-office peak load occurs when the batteries have been significantly discharged and full cooling is needed.

Solution Using 2N Approach

Two 1,500 kW units, total capacity: 3,000 kW
Typical initial load level: 17 percent
Typical final load level (after load growth): 25 percent
Dark office load level (after load growth): 50 percent
Level of typical load redundancy: Needs + 1

Estimated fully installed capital cost: $900,000

Solution Using Integrated Paralleled Generation

Three 500 kW units initially, total capacity: 1,500 kW
Fourth 500 kW unit added at time of load growth
Typical initial load level: 30 percent
Typical final load level (after load growth): 38 percent
Black office load level: 75 percent
Level of typical load redundancy: Needs + 2

Estimated fully installed capital cost: initially $500,000; future investment of $100,000

Note: Paralleling switchgear cost included with the generators for integrated paralleling solutions

the cellular market, there is a wide variance in the levels of maintenance being performed. Some carriers in some regions perform two maintenance cycles annually while others perform no maintenance at all. Some use factory-trained technicians while others use general site-maintenance personnel. The level of reliability and long-term service provided by the generator system will be a function of its maintenance levels. Annual maintenance by trained personnel is always recommended.

Location

Generators can be configured for installation inside a shelter or in a self-contained housing outside. Often, new sites using a shelter configuration will integrate the generator inside to minimize site space allocation and simplify site commissioning. Retrofit and cabinet sites will use generators with outdoor enclosures. The housing will typically be in a sound-attenuated configuration in urban settings and may be in a basic weather configuration for rural sites. The outdoor configurations will be placed on a small, concrete pad close to the electrical interconnection point. Retrofit applications often use conduit runs above ground while new construction may use underground runs.

Transfer switches

The electrical interconnection between the generator and the utility is made with an automatic transfer switch. For retrofit sites, this is often located outside. For cabinet sites, the automatic transfer switch may be freestanding or mounted onto the generator. For new construction with shelters, the automatic transfer switch is typically located inside the shelter and may be a combined device. It is possible to purchase configurations that combine automatic transfer switch, service, load center and transient voltage surge suppression.

Central office generator configurations

Central office applications are dominated by diesel and some bi-fuel configurations. Bi-fuel is diesel combined with natural gas. Due to the mission-critical nature of the central office, operation with on-site fuel is typically a desired requirement. In addition, large-capacity natural gas engines are significantly more expensive and liquid propane configurations are typically not available above 150 kilowatts.

Single generator

When designing central office backup power systems, multiple power topologies need to be considered. The most basic is a simple, single engine-generator configuration. In this configuration, the single engine meets the needs of the site with no redundancy. Though this configuration is conceptually the simplest, it may not be the preferred solution for central office applications due to reliability limitations. A single engine-generator configuration has hundreds of

potential failure modes. The end result, based on third-party studies, is that a single engine-generator has typical reliability of 98 to 99 percent given a 25-year life cycle. This includes equipment, system and human interaction failures.

Two generators

To improve reliability at a central office, redundant generator configurations should be considered. The most basic redundant configuration is to use two large-capacity engine-generators with enough capacity for either to power the central office. This configuration is often referenced as a basic 2N approach. This approach has the advantage of being extremely simple, and conceptually, it matches typical dual-feed power-distribution designs. The disadvantage of this approach is that it requires each engine-generator to have sufficient capacity to power the central office from a dark-office state and also provides for some future load growth. Given that the typical central office load on any given day is only 40 to 60 percent of the dark office design value, a 2N approach may result in the generators being only loaded between 20 and 25 percent before factoring in future load growth needs.

Paralleled generation

The other option in high-reliability generator design is to use paralleled generation. By using multiple smaller generators connected in parallel, the central office gets the same or an even greater level of redundancy as that offered by the 2N approach while conserving capital and supporting scalability. This type of approach is often referenced as an N+1 or N+2 based on the number of redundant generators running relative to the central office's load level.

Paralleled generation limitations

The concept of paralleling multiple gensets to produce greater amounts of power is not new. In fact, this arrangement is a well-proven method common with large-megawatt units in premium installations. Parallel power solutions have always offered the standby generation marketplace significant advantages. However, the implementation of these solutions has been limited because of the following constraints: cost, space, complexity, issues of single source responsibility and issues of local switchgear expertise.

Historically, paralleled power generation was accomplished through using third-party vendors that integrated UL891 dead-front panel boards into generator-paralleling switchgear. Though effective, this approach has its limitations. Cost is the most notable drawback. The installed and commissioned cost for low-voltage traditional generator paralleling switchgear is typically $50,000 to $70,000 per section. The switchgear also needs dedicated floor space inside the building — plan for each section to be 36 inches wide by 48 inches deep and 90 inches tall.

The most troubling issues with the traditional dead-front panel board approach to paralleling relative to cen-

tral office applications are complexity and local expertise. Each generator in the system historically included four to six microcontrollers. These controllers were a combination of analog and digital technology from various manufacturers that were hardwired together into an amalgamated system. Thus, a two-generator paralleling system would require from nine to 14 controllers once the master control section is included in the controller count. Another concern is the expertise required for commissioning and customizing the switchgear lineup. These issues create a significant reason for central office applications to refrain from embracing this technology.

Integrated paralleling

To access the benefits of parallel generation while removing the cost and complexity limitations, generator manufacturers have integrated generator paralleling into the genset package. This integrated approach to generator paralleling uses a single digital controller for each generator, connects the generator controllers together through simple two-wire digital communications and integrates the power switching onto the generator. Integrated generator paralleling technology maintains all the benefits of traditional paralleling while removing its constraints.

Using integrated generator paralleling and combining smaller generator sets to power a central office is possible and highly desirable. This arrangement provides several advantages over large, single-engine and 2N configurations:

- Scalability
- Reliability/redundancy
- Availability
- Serviceability
- Flexibility
- Cost-effectiveness
- Reduced emissions

Designing for today's market

As telecommunications providers implement power solutions, all aspects of the generator and battery implementation need to be considered. Today's market demands network reliability and cost-effectiveness. Because the cellular industry is extremely competitive, it requires system designers and managers to always see the complete picture. The intent of the foregoing information is to help challenge some traditional norms and, through solid evaluation of all options, to encourage the implementation of the best solutions. agl

Mike Kirchner is industrial training manager at Generac Power Systems, Waukesha, Wis. He has nearly 20 years of experience in the electric power industry. He has an MBA and an electrical engineering degree from the University of Wisconsin and has worked as a field engineer and electric power systems engineer. He has designed hydro-turbine and plant-control systems. He has been with Generac Power Systems for 10 years and is a member of IEEE. Email: *mkirchner@generac.com.*

DAS Offers Flexible Infrastructure Deployment

Distributed antenna systems cover areas where more traditional infrastructure is infeasible, impractical or insufficient. DAS is an element of the nationwide, robust wireless infrastructure on which the dynamic wireless marketplace depends.

Speech by Angela E. Giancarlo

FCC Commissioner Robert M. McDowell's chief of staff and senior legal advisor, Angela E. Giancarlo, spoke June 11, 2008 at the DAS-in-Action event sponsored by the DAS Forum at the Omni Shoreham Hotel in Washington, D.C. She reviewed the role DAS plays in delivering wireless services and touched on the subject of pole attachments. The following is her speech, edited for length.

Infrastructure provides the backbone that fosters the continued deployment of beneficial wireless services, including broadband. By developing unique and needed solutions where traditional infrastructure applications are not feasible, the DAS Forum's members deliver an important solution to help provide the capacity for the networks that will shape America's future and equip all types of consumers — retail, commercial and public safety — with the wireless services they have come to expect.

My remarks highlight three areas: (1) the growth of wireless services; (2) the retail, commercial and public safety consumer benefits resulting from that growth; and (3) the importance of infrastructure and DAS solutions to maintaining and enhancing these benefits.

Growth of wireless services

First, regarding growth, the FCC — and all of us here today — recognize that the wireless industry has witnessed unprecedented growth, in both the number of users served and the breadth of services available to the public, and shows no sign of abating. A large reason for the success of the wireless industry is the relentless innovation spurred on by market competition — competition to provide more applications, more reliability and with greater efficiency and speed.

Angela Giancarlo: 'You will no doubt see to it that the new market entrants use DAS deployments to catch up with their more-established competitors.'

Wireless communications is at an important crossroads. There are nearly 260 million wireless subscribers in the United States, and 3.3 billion wireless subscribers worldwide, comprising half of the 6.6 billion people in the world. One out of every six American homes has only wireless telephones, and one out of eight American homes receives all or almost all calls on wireless telephones despite having a landline in the home. The good news for the DAS Forum is: Americans' increased reliance on wireless services translates into a greater need to maintain network efficiency and capacity.

Furthermore, the deployments that will result from the recent AWS and 700 MHz auctions provide an unprecedented opportunity for the development and expansion of wireless services, and the

corresponding need for infrastructure development. The expansion of wireless broadband will bring countless economic opportunities and broadband access to more Americans than ever before. You will no doubt see to it that the new market entrants use DAS deployments to catch up with their more-established competitors. DAS provides another means to foster wireless competition and consumer choice.

Consumer benefits

Next, regarding the consumer benefits, it is difficult to overstate the positive effect of mobile services in America and across the globe. Wireless is no longer just a means to make a phone call on the go. Wireless consumers now demand that their email, Internet access, music, movies and television are available anytime, anywhere, too. Certainly, infrastructure providers play a critical role in extending the consumer benefits associated with wireless growth.

Moreover, dependable wireless coverage is critical in emergency situations. Through implementation of the WARN Act, the FCC, in partnership with industry, has developed a system to alert citizens to danger through text messages. We will all benefit from the important work this group has undertaken. At this point, the Commission is already well poised to get out of the way and let the private sector deliver the new alert system for the benefit of America's wireless consumers.

Enhanced 911

With respect to Enhanced 911, there are over 290,000 emergency calls made per day. More than 50 percent of these calls are made from wireless devices. For over a decade, the FCC has worked to ensure that consumers and first responders alike will benefit from the latest location-capable wireless technologies. That said, a broad array of entities — wireless service providers, technology vendors and public safety — have told the Commission that rolling out a system of improved wireless E911 location accuracy is premature. Whatever the outcome of the present litiga-

(Continued on page 44)

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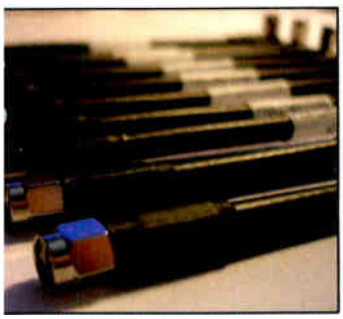

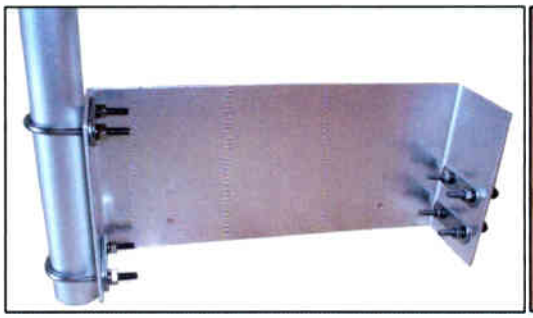


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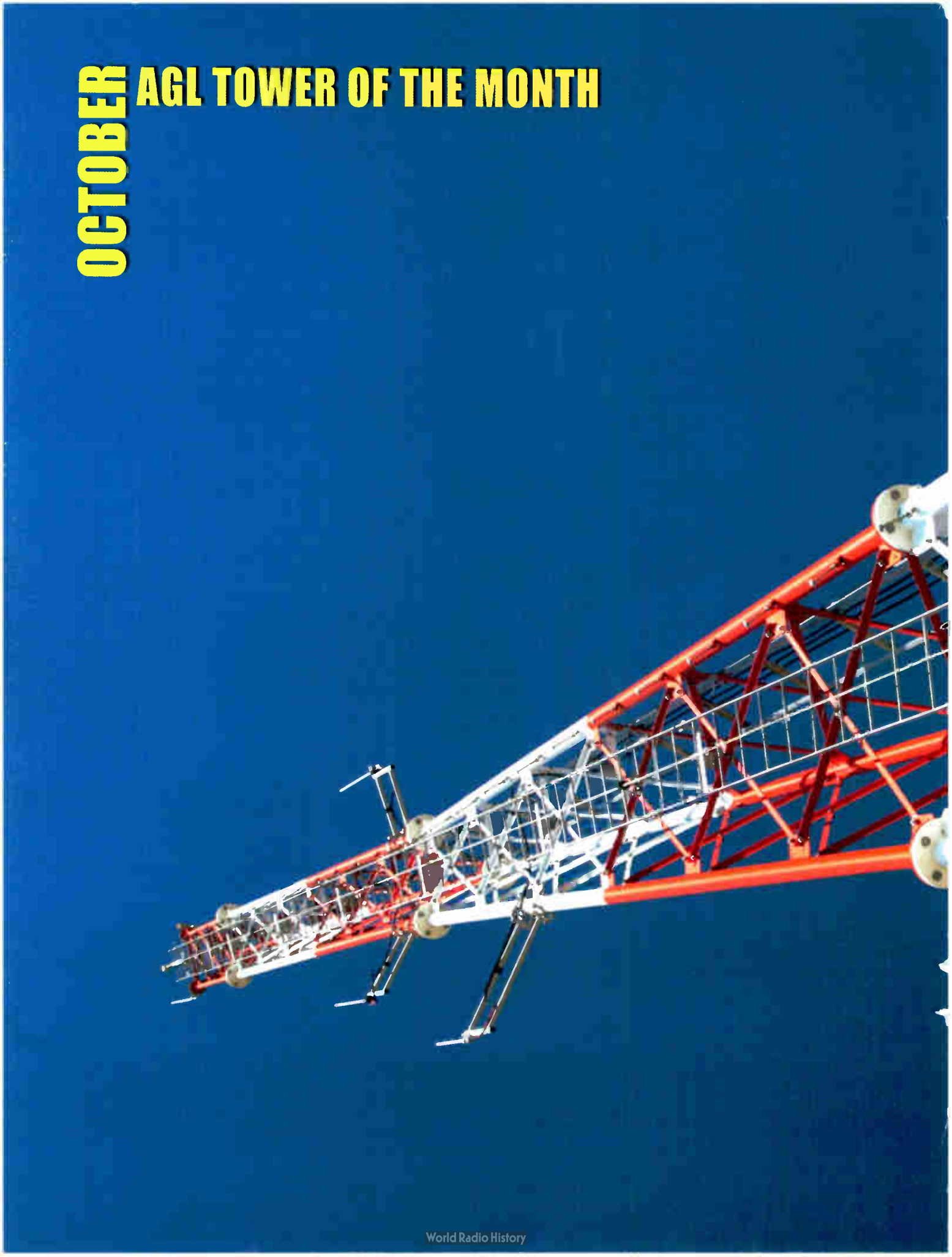

MANUFACTURER
GlenMartin

OWNER
Middletown Area
School District

MODEL
HS-Series Self-Supporting

YEAR BUILT
2008

HEIGHT
180 Feet

APPLICATION
FM Broadcast and
Two-Way Communication

LOCATION
Middletown, PA

(Continued from page 40)

tion, we are confident that infrastructure providers will be part of the solution.

Finally, we must move forward together fully cognizant of the efficiencies associated with infrastructure and DAS solutions. Certainly the dynamic wireless marketplace depends on robust wireless infrastructure nationwide, without which dependable wireless coverage is not possible. As the number of wireless subscribers and services grow, so must wireless infrastructure.

Your networks offer flexibility in infrastructure deployment for areas where more traditional infrastructure is infeasible, impractical or insufficient

DAS is a wonderful example of the benefits of market innovation — you are responding to the need for additional infrastructure innovations for use in sensitive environments in which traditional wireless facilities are infeasible. DAS is already providing specialized solutions in locations where traditional wireless facilities are infeasible. Your networks offer flexibility in infrastructure deployment for areas where more traditional infrastructure is infeasible, impractical or insufficient. Moreover, your efforts show that when the private sector has the freedom and flexibility necessary to resolve challenges and satisfy consumer demand on its own, it can and will rise to the occasion.

Congress has indicated that the Commission has a role in ensuring that state and local developments do not undercut federal objectives to facilitate widespread, dependable communications networks by removing barriers to infrastructure investment. The Commission is currently revisiting its rules on pole attachment rates, terms and access conditions as they apply to all types of users. We are hopeful that, as we move forward, this proceeding will provide needed certainty concerning the role of existing utility infrastructure to DAS architecture. agl

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Before joining Commissioner McDowell's staff, Giancarlo was associate chief for spectrum policy in the Public Safety and Critical Infrastructure Division of the FCC's Wireless Telecommunications Bureau. She was a senior associate in the law office of Hogan & Hartson in Washington, D.C. She began her career in the office of former U.S. Rep. Jack Kemp (R-N.Y.). She earned her law degree at Columbus School of Law at Catholic University of America. Her email address is *Angela.Giancarlo@fcc.gov*.

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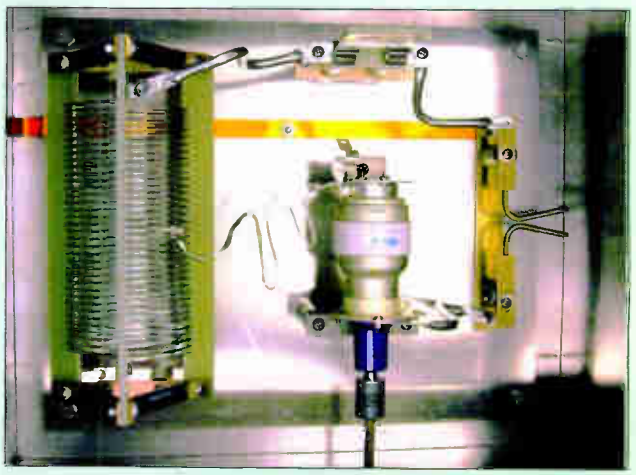

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NBC's *Dateline Presents* Highlights Tower Climbers

What may have been proposed as a reality series became an episode of NBC's *Dateline Presents*. The program's camera followed a tower crew for four months, recording aspects both technical and personal regarding workers on telecommunications towers.

by Don Bishop

Broadcast on July 21, the NBC television network's *Dateline Presents* episode "Tower Dogs" followed a tower crew for four months to document part of what tower maintenance company owners, subcontractors and workers face when working on cell towers.

The episode emphasized risks, accidents, the workers' home lives and interpersonal conflicts, and spent less time on safety requirements and education offered by the federal government, trade associations and employers. Despite the limited time devoted to safety subjects, viewers saw glimpses of equipment safety inspections, safety posters, training classes and an example of a daily jobsite "tailgate" safety meeting. The broadcast aired only a few seconds of a half-hour interview that one of the program's producers conducted with an expert on the subject of safety.

A voiceover at the broadcast's opening set the tone: "The courageous tower workers who are the beating heart of high-tech America. Proud to be called 'tower dogs.' Tonight, take a never-before-seen journey into their perilous world where one false move can cost a life and change everything. They spend long days and nights on the road, a family whose bonds are forged in blood, sweat and steel. They live their lives in the air for their loved ones on the ground. And tonight, someone won't make it down alive. Join us as we fly high and go inside the most dangerous job in America."

About that phrase, "tower dog": The owners of several tower maintenance companies told us they had never heard tower workers refer to themselves that way until the TV episode aired, and that they were "offended by the label." Research revealed a website that registered the name in 2003.

Kyle Waites, the owner of Nashville, Tenn.-based Phoenix of Tennessee, a tower engineering, construction, inspection and maintenance company with 74 employees and offices in five states, was featured in the *Dateline* episode. Waites is seen throughout the episode because his company subcontracted a small, independent tower crew for the work performed under the eye and camera of the *Dateline* producers. One of the producers, Doug Delaney, is himself a veteran tower climber.

As the camera followed the tower crew, viewers became acquainted with the crew boss, Nikki Collins, and her tower climbers, Ernie Hart and Cody Pond.

The episode portrayed Hart as a capable if somewhat unreliable worker motivated by the need to earn money to meet child-support payment obligations and, surprisingly, as someone who is afraid of heights. One evening he was shown packing his car and departing without notice, leaving the crew without enough tower climbers for its assignment the next day.

Pond was described as a "movie star" or "hot shot" who, with two years' experience, is relatively new to the work. "I move pretty freely on a tower, but I'm very safe. I try not to get overconfident. If I have that one slipup, I'm not going very far," Pond said, referring to his fall-prevention equipment. "It's fall prevention, not injury prevention," he added.

Of Pond, Waites said, "Whenever you get a guy like that, you really got to keep on him and stress the safety to him. It's like a stallion or something like that. You don't want to break his spirit, but you've got to get him under control. He's a kid on a jungle gym. He's like a monkey on monkey bars."

Waites, on the other hand, said that although confined spaces bother him, he never has been afraid of heights.

Kyle Waites: 'Gravity never sleeps. Gravity is always there to reach out and tap you on the shoulder.'

Nikki Collins: 'You only get paid a certain price for the job and if the job takes two weeks or three days, you're going to get paid the same.'

Doug Delaney, a *Dateline* producer and a tower climber himself, unexpectedly became involved in a minor injury to tower crew member Cory Pond.

Surprisingly, tower worker Ernie Hart revealed on camera that he has a fear of heights. He said he 'risks his life every day' for the money.

Cody Pond: 'I move pretty freely on a tower, but I'm very safe. I try not to get over-confident. If I have that one slip-up, I'm not going very far.'

Kevin Hayden: 'You constantly remind people of their environment. The 100 percent tie-off. Talk the job out before we start. Constant reminder is a very important aspect of safety.'

"Gravity never sleeps. Gravity is always there to reach out and tap you on the shoulder. I think you should fear the heights or fear gravity. You dang sure better show it the respect it deserves," he said. "Our greatest fear is having to call someone up and tell them that their husband, wife or son is not going to make it back."

In the broadcast, Collins pointed out that most of the work is paid by assignment, not by the hours it takes to do the work. "You only get paid a certain price for the job and if the job takes two weeks or three days, you're going to get paid the same, so you gotta get it done," she said.

Collins said that the erection of monopoles offers one of the best opportunities for her crew. "Monopoles, you build them quick, and you can usually make a lot of money on monopoles, because it's quick," she said.

Yet the broadcast said that monopoles are among the most dangerous towers for climbers. Delaney put on his safety equipment and a hardhat-mounted camera and climbed one to demonstrate the difficulty.

In another demonstration of how dangerous the work can be, Delaney accompanied Pond as he serviced an antenna mounted on the side of a water tank a hundred feet or so above the ground. Pond lowered himself into position with a rope and with a connection to a safety line. He realized he forgot to bring a measurement tool called a smart level, and Delaney lowered one down to him on a line. The wind caught the line and swung the tool in Pond's direction, striking him in the mouth and knocking him unconscious for a few seconds. Camera operators captured video of the incident from the ground and from the top of the tank.

Calling to mind that some tower workers lose their lives and fulfilling the opening voiceover's warning that "tonight, someone won't make it down alive," the *Dateline* episode covered the funeral for Jonathan Jay Guilford, a climber who at times had worked as part of Collins' crew, and who died from a fall from a tower in Indiana on May 16. Pond and Guilford

Dateline **producers went with the tower workers to a funeral for Jonathan Jay Guilford, who had worked with Nikki Collins' crew. Guilford died from injuries suffered in a fall from a monopole in Indiana on May 16.**

attended safety class together. Waites also knew Guilford.

"Anytime a death happens, the first thing you ask yourself is, 'Why?'" Waites said.

The program aired a brief excerpt from a half-hour interview with Kevin Hayden conducted by a *Dateline* producer. Hayden was chairman of the National Association of Tower Erectors for seven years, and he is a member of the organization's board of directors. The trade association promotes safety for tower climbers. "You constantly remind people of their environment. The 100 percent tie-off. Talk the job out before we start. Constant reminder is a very important aspect of safety," Hayden said.

The day after the *Dateline* episode aired, NATE expressed disappointment with the broadcast. "The program did not present an accurate view of the professionalism and work habits of most tower crews," a statement from NATE reads. "NATE hopes this shocking portrayal of the tower industry will draw attention to the men and women who

Smithsonian Tower-worker Article in 1997

The NBC television *Dateline Presents* broadcast "Tower Dogs" did not represent the first time the occupation of tower hand or tower climber received national exposure. In July 1997, *Smithsonian* published a cover article about workers employed by V.L. Strickland Tower Service of Abilene, Texas.

"We Got Us Some Sky Today, Boy," by James R. Chiles with photography by Layne Kennedy reached an estimated 6 million readers or more. An estimated 5 million viewers watched the *Dateline* episode.

"I don't recall any industry reaction to that article and it clearly depicted old-school work," said Winton Wilcox, president of ComTrain, a company that offers certified tower climbing safety and rescue and basic tower construction training.

"The article showed climbers with minimum to no fall protection equipment who used rigging equipment and riding techniques that now are considered unacceptable," Wilcox said.

The article described workers' troubled home lives, as did the *Dateline Presents* episode. "On the road, you work seven days—that's why I got divorced," Chiles quoted Butch Strickand as saying. "If it was up to me, I'd still be married, but it wasn't."

Writer Chiles quoted Ken Meador, vice president of TWR Telecom, as saying, "You can get the equipment you need, but you can't find people just like that. Tower workers run the gamut in age and background, but they have one thing in common. They're all adrenaline junkies. I grew up in the oil patch, and I thought those men were the true individualists, a hard bunch. But not just anybody can be a tower hand. Fear of heights may be the only universal fear."

Lensman Kennedy photographed a worker riding a trolley line to an elevation on a tower, a practice considered too dangerous to be acceptable today.

As Chiles and Kennedy watched, the workers hurried to complete a 500-foot tower in West Texas so the new TV station it would serve could meet an FCC deadline to begin broadcasting or lose its construction permit and, ultimately, its license.

Dateline Field Producer Doug Delaney climbed a monopole to demonstrate why they are considered among the most dangerous towers to climb. The broadcast said many fatalities among tower climbers involve monopoles.

face difficult job conditions each day to make cellular, broadcast and radio communications possible."

The crew boss, Collins, had referred to being paid by assignment, not by the time it took to do the work. The NATE statement said that unrealistic timelines and budgets have an effect on safety, and at least the episode called attention to that. "There is an inherent pressure in our industry to work to the clock rather than to the safety needs of the task at hand. It is our hope that this opens a dialogue with tower owners and operators to show the worth of an investment in safety and the importance of taking the time needed to complete the job properly the first time," noted the NATE statement.

Part of the episode included video showing Waites conducting an inspection of Collins' safety equipment and rejecting a safety harness. He carried it to a trashcan. According to NATE, the example pointed out the importance of hiring qualified contractors with the proper equipment and skills to accomplish the task at hand safely. "One of the

Students receiving classroom instruction at ComTrain learn how to fasten and adjust personal fall-protection equipment.

As an example of safety meetings that OSHA requires to be conducted in the field, students at ComTrain participate in a safety meeting prior to climbing a training tower.

subcontractors featured on the *Dateline* piece was subject to a safety audit by the general contractor and did not have the correct safety equipment in proper working condition. These safety audits are critical to ensure that the work is done in the safest way possible," the NATE statement said.

Of crew member Hart departing without notice, NATE said it pointed out the need for adequate training of all members of the crew. "One of the subcontractor's crewmen walked off the job, putting the team behind schedule because he was the only person trained and qualified. When evaluating a subcontractor, it is important to ensure that all members of the team are properly trained so that the team isn't hampered if one person becomes unavailable," NATE's statement noted.

The statement said that NATE hoped that the *Dateline* episode would help tower owners, operators and others involved in tower construction and maintenance to realize their role in protecting men and women working aloft. "We hope that this will start a dialogue to address what can be done to prevent future accidents and ensure that everyone goes home safe at the end of the day," the statement reads.

"We believe that the only way the industry can conquer its challenges is by creating a continuous dedication to safety. This is a dedication that must extend from the tower owner and operator, to the project manager, primary contractor, subcontractors as well as every person who works on a tower site from a project's beginning to end. The dangers of this industry are not going to vanish, but must be addressed by an ongoing concentrated effort by everyone involved," the NATE statement said.

Winton Wilcox, president of Monroe, Wis.-based ComTrain, a company that teaches tower climbing safety and rescue, and basic tower construction, said that anyone who believes the *Dateline* episode did not offer a current depiction of tower crews is out of touch with the industry. "They showed the two common tower worker profiles in the industry: the more experienced worker who is independent, rebellious and competent and the young adrenalin junkie. Those are common types. We see them on a regular basis [in our classes]. It takes an amount of self-confidence to do that work," he said.

"This video was a fair representation of the state of the tower industry. There may be 10 to 15 percent of the people who are more financed and stable than was depicted, but there is 10 to 15 percent that is less structured, organized and professional. This was good median depiction," Wilcox said.

Wilcox cited a July 1997 *Smithsonian* article, "We Got Us Some Sky Today, Boy," as a benchmark for comparison. "The contrast between the 1997 *Smithsonian* article and the *Dateline* episode demonstrates the growth and maturing of the industry. In the *Smithsonian*, you saw guys with inadequate fall protection and riding lines the way it was 10 years ago. The changes are dramatic. In the *Dateline* episode, we had people with hard hats, fall-protection equipment and doing safety meetings and audits. And 10 years ago that was practically nonexistent."

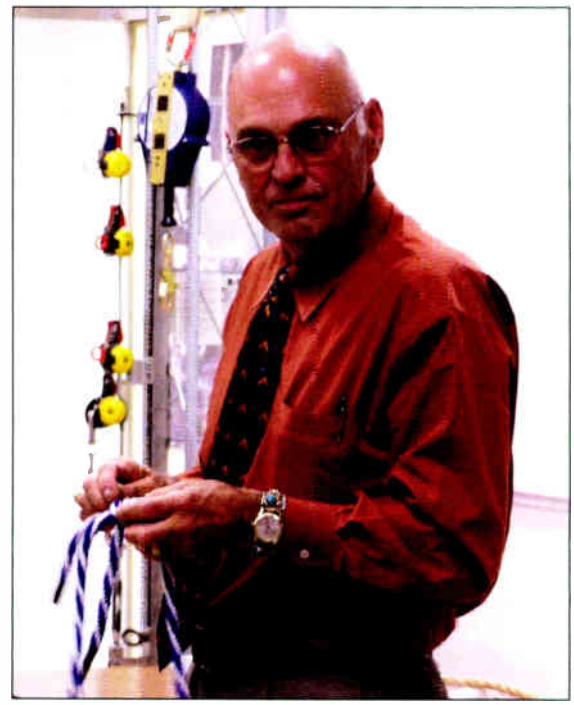
The *Smithsonian* author, James R. Chiles, attended a NATE convention in 1997, and so did Wilcox. "One of the founders of NATE made a public address

at the convention in Mesa, Ariz., and said no one in this industry has a 100 percent tie-off policy. Wow. We have come a long ways in 10 years," Wilcox said.

A segment of the *Dateline* episode that drew criticism from some quarters showed the tower crew spending time in a bar one evening. Crew member Hart was shown as being "drunk" — facing the camera, he said he was. Wilcox commented, "That bar scene seems to be one that a lot of people latched onto with negative responses. They think that is unrealistic. You take any workers and displace them for two or three weeks and they will get out. They will go bowling or shoot pool or go sightseeing. They are not going to sit in the motel and read *War and Peace*. Social life has always revolved around bars and taverns. It's where you can shoot pool and talk to people and socialize. The people who act as though tower people don't do that, and the fact that one of them overindulged, that's Americana and it's real."

Wilcox said that what the broadcast *did not show* because it *did not happen* helps to demonstrate that although the crew selected as an example might not have been the best, neither was it the worst. "They didn't show drug issues. They showed a guy quitting his job but not stealing the truck and tools, which is not uncommon in this industry. Any manager could tell you about guys walking off the job and taking the trucks. Or giving a crew member a couple of hundred bucks to get tires and gas and never seeing them again. We have a highly mobile workforce."

Wilcox continued, "They didn't show free climbing, riding the line and lack of



Winton Wilcox of ComTrain: 'The progress in the last 10 years is demonstrable. The things we need to work on are well depicted in the film.'

Students at ComTrain receive instruction on a tower under winter conditions they are likely to encounter in the field.

hard hats. The industry is deceiving itself if it thinks it's polished. We not only are not polished, we're not standardized. The progress in the last 10 years is demonstrable. The things we need to work on are well depicted in the film."

Wilcox pointed out that the episode showed a primary contractor doing an equipment audit of a subcontractor, "and I thought that was excellent. That is a big difference from 10 years ago. Also, when I started teaching this as a public commercial course just getting people to wear a hard hat was tremendously difficult."

As an instructor who trains tower workers with skills ranging from those of a novice to those of a veteran, Wilcox made the observation that there is no way for a tower worker to measure his level of skill. "We don't have apprentice, journeyman and master levels as unions do. We have no academic standards. We have no measuring stick for people to evaluate what they're worth, what they're capable of and what you can expect of them. We're managing people who are independent, rebellious and adventurous, but we can't measure their skills and aptitude. It takes a tremendous amount of management energy to control an effective tower crew," Wilcox said.

Adverse reaction to the *Dateline* episode surprised a veteran tower worker known to *AGL* who asked not to be identified because he was not authorized to comment. "This was a story that needed to be told. This was a slice of life, a small glimpse into the world of tower workers. It was meant to inform, not to campaign, blame, lionize or criticize. ... I was absolutely stunned by the feedback from our peers. They are *no* brothers of mine," he said.

Regarding the safety inspection in which Waites found an unsuitable climbing harness, the worker said, "A few pieces of equipment in Nikki Collins' trailer were obsolete or otherwise substandard. We all know that new regulations come down regularly that call for the discontinuance of equipment. I have *never* been in a job trailer in my life that did not have a piece of equipment that was obsolete. Does that mean that equipment is being used? Absolutely not. And it is the continual shakeout and inspection of these trailers that helps keep everybody up to date. I have three belts. *One* is up to code. The same goes for lanyards and fall-arrest equipment. Isn't identifying a piece of outdated equipment a *good* thing? Did they find anything that was questionable? Yeah — a few things. Check your own job trailers, shops and storage units. What will you find?"

Some who viewed the program said the hourly rate of $14 at which crew member Hart was said to be paid was unexpectedly low, yet the worker who commented to *AGL* said that figure is the average rate of pay for a typical worker. He added, "What the program neglected to reflect is the $600 to $700 per week tax-free that a man in the field is getting

per diem, and that the accumulated pay naturally rises depending upon the hours worked and overtime. It is not unusual for a tower hand with one year of experience to make upward of $70,000 per year. There is also a *very* small segment of our workforce that is unionized iron workers. They make more money, but they are not representative of the majority of tower hands in the field."

The worker said that although it was clear many viewers of the *Dateline* episode who work in the industry and who posted comments on various blogs and in response panels to news stories found the bar scenes the most objectionable among those that portrayed the life of a tower worker, "It was also the most misunderstood. Do not soldiers, police officers, firemen, construction workers, fishermen and loggers ever go out for a beer after work? This, to me, was the most egregious of attacks on these people. I know 50 Ernies, and I know 100 tower workers much wilder than he will ever be. ... The general audience just saw it for what it was — work hard, play hard — a little slice of the life."

The worker concluded, "Nine tower workers have died so far this year. If that program prompts just one worker on one tower to think twice before he or she makes a move that disregards their training, or to use their equipment in a manner not recommended by their trainers, then the show served its intended purpose. And I think everyone in the industry should respect, acknowledge and appreciate that."

Back at ComTrain, Wilcox said he received positive comments about the *Dateline* episode from representatives of large companies involved with tower construction such as Andrew and General Dynamics. Negative comments came mostly from individuals, he said. "A unique reality is that anyone who loves this business and who works in the field believes they're the best. There's a strong feeling of, 'I am better than you and I can do this better.' So naturally they're going to backseat-drive. 'I would have done this better or different' [from the way the crew shown on *Dateline* did]. That's internal competitive nature. To have that kind of view supported in a broad stroke by the spokespeople of the industry is an unfair condemnation of the way this business is running," Wilcox said.

The *Dateline* episode was said to be a one-time broadcast to cover the subject of tower climbers, but at least one source said it was based on a proposal made to the network for a reality series about tower climbers.

MSNBC has posted a number of videos that add to the *Dateline* episode, including a demonstration of climbing technique, climbing during a winter storm, the use of a man basket to ride to the top of a tower, and a remembrance from the mother of a climber who died in a man basket accident in Iowa. Visit *www.msnbc.msn.com/id/25786803/*. agl

Palisades United Methodist Church, San Clemente, Calif., in recent weeks signed a lease for a monument-style free-standing tower, similar to the one pictured, which will cover a 12-foot by 14-foot area. The 30-year, $1,800-a-month lease was negotiated over the span of two and a half months.

Divine Deployment: Cell Sites on Church Property

While churches are becoming more and more popular as sites for cellular antennas, the fact remains that organizations focused on theology may not have the requisite knowledge of the leasing business. Sometimes it pays to ask for help.

by Mike Ritter

Most churches love leasing space to wireless carriers. Just ask Doug Williams from University United Methodist Church in Irvine, Calif. "Our leases have made a big difference for us," he said.

Williams was referring not only to the recurring lease revenue but also to the two 50-foot crosses on the church property that were installed as stealth antenna sites. The money helps fund ministries and the crosses draw attention to their property. University United Methodist negotiated its leases well by enlisting the help of an attorney.

"We made sure we got a fair deal and we continue to enlist someone to help us with ongoing questions and issues," said Williams. This is not the rule for most churches, however, because few are able to spend the money it takes to get professional advice.

Sites with appeal

Churches have been sought out as sites by the wireless carriers for several years. Their appeal is related first to their location and second to the features commonly found on church properties. Many churches are located in densely populated communities where carrier coverage and capacity needs are high. Churches also typically have taller structures such as steeples or bell towers providing excellent line-of-site coverage for cell site deployments. Nearly all have ample space for the addition of a ground-based cross similar to the one at University United Methodist. As carrier build-outs continue into residential areas, the desirability of church properties is likely to increase.

It's not always a good fit though. Some congregations bristle at the idea of cell sites on their property. Citing concerns about health hazards, tax liability, aesthetics and even network content, some churches turn away the lucrative lease offers. Zoning challenges and community resistance sometime impede the process and there are typically additional costs to conceal antennas. Despite these challenges, the United States has an estimated 10,000 church landlords.

Citing concerns about health hazards, tax liability, aesthetics and even network content, some churches turn away the lucrative lease offers

Lease negotiation

When it comes to negotiating the lease, several specific issues concern churches. The rent amount is always important because churches are typically self-supporting nonprofit organizations with tight budgets. In some cases, the rent from a lease can make the difference between funding a ministry or mission or not. Access to the property by the tenant must usually be restricted during church services and other functions.

Taxes are another important matter. Although most churches qualify for U.S. income tax exceptions, some may not be exempt from local property tax reassessment and will seek reimbursement from the tenant. Churches are not usually looking for special treatment but want their tenants to understand the attributes that differentiate them from other building and property owners.

Most churches make decisions by committee vote. This can cause long delays and may turn carriers away because time to market is the primary goal of most cell site deployments. Understanding the decision-making process and offering incentives to quick lease signings will help speed the process. Few churches seek the assistance of outside representation to assist with negotiation and help streamline the process. In recent years, companies have emerged offering advice

Tower Seekers worked out a 30-year lease for Orangethorpe United Methodist Church in Fullerton, Calif., with revenue of $1,800 a month. The lease, which is structured in five-year increments with a 3 percent annual escalation, was negotiated with T-Mobile over a two-month period. The space leased amounts to 12 feet by 18 feet, and the antenna itself is built into the façade on the top of the church sanctuary.

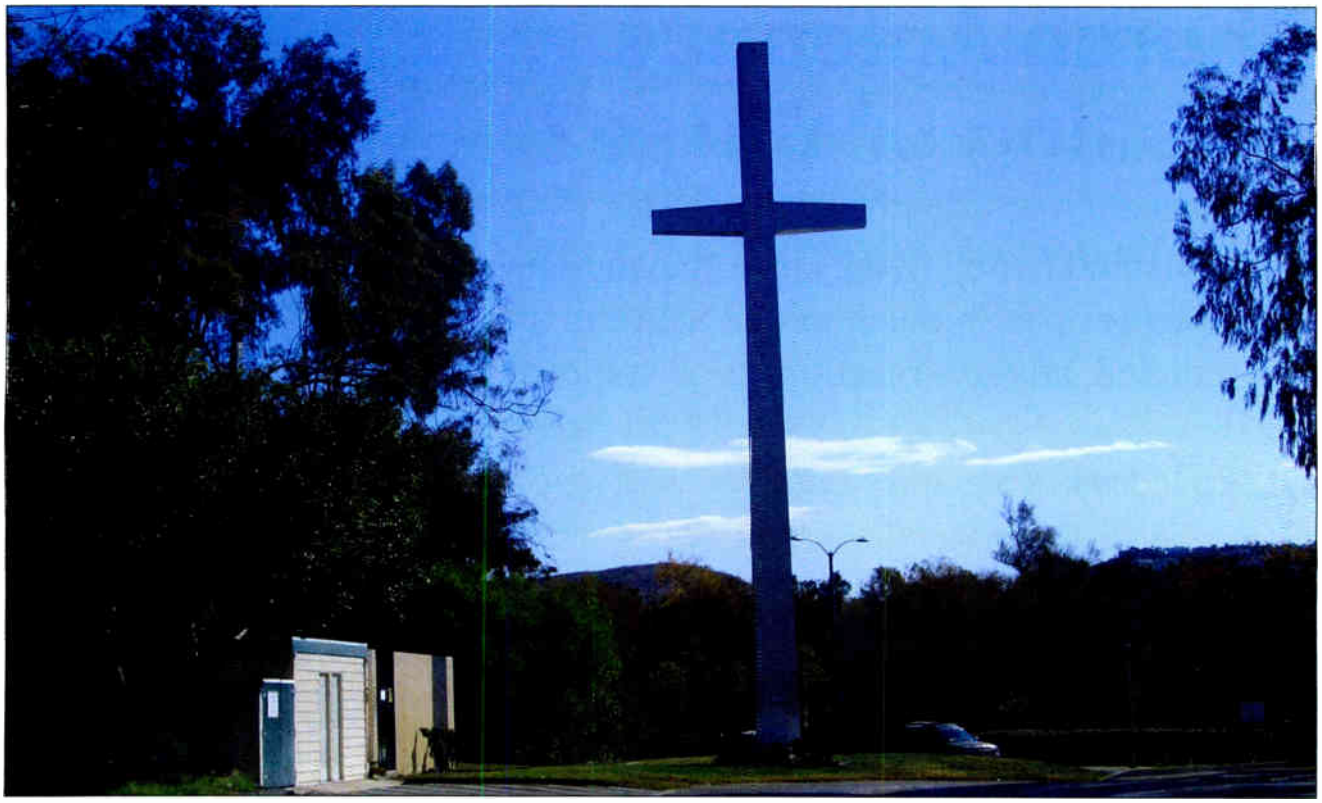
and counsel to landlords seeking such assistance. The goal is to level the playing field for lease negotiations and to expedite the deployment process so that both sides benefit.

Marketing church properties

Some churches are taking a proactive approach by marketing their properties. They want wireless companies to know they are friendly and willing landlords. Churches needing extra revenue are actively seeking it. Consultants provide help to landlords by offering them education and professional representation with lease negotiation and site management. This benefits the church client but also has an upside to the tenant by expediting the lease signing and speeding deployment.

Local planning and zoning ordinances in urban areas frequently require concealment of the antennas. As a result, "stealth sites" are more common now than ever when deployed at churches. This adds to the cost and time required for construction but eases the aesthetic effect on the surrounding area. In fact, recent advancements in stealth siting can improve the look of a church. At a minimum, larger sites, such as crosses, attract attention to the property to the benefit of the church.

A common scenario with churches is the presence of schools either collocated or adjacent to the property. This usually raises concerns about the health effects of radio frequency emissions and can sometimes cause opposition from parents and neighbors. While this rarely influences the church to turn away a lease offer, it may cause delay in getting the site approved by local officials in addition to straining relations within the church. Accurate and unbiased information goes a long way to quelling



Using an attorney, University United Methodist Church, Irvine, Calif., negotiated a $1,000-a-month lease with Pac Bell, now T-Mobile, in 1997 for a 50-foot tall freestanding cross, which would house a cellular antenna. In 2001, a lease was negotiated with Sprint for a second freestanding cross antenna enclosure, shown here, at a rate of $1,500 a month.

the emotions surrounding such issues. Publications from the FCC and FDA available online can help provide facts for those concerned.

Once the lease is signed and the site deployed, the landlord and tenant may experience difficulty communicating. This problem may arise when carriers merge and leases change hands. Third-party renegotiation offers and buyout proposals may cause confusion. Church leaders who seek answers from their tenants may find it a challenge to connect with the right person or office.

Church landlords are grateful for the opportunities that come from leasing space to wireless tenants. Besides recurring revenue, the tenants sometimes offer improvements to the land or buildings. "They actually helped improve our facilities by replacing the roof of our steeple," said Pastor Bill Jenkins from Christ United Methodist Church in San Diego. For Jenkins and his church, the lease just made sense. agl

Mike Ritter is president of Carlsbad, CA-based Tower Seekers. An attorney and real estate broker, Ritter is a former FCC official and the owner of Ritter Radio, a telecommunications consulting and brokering firm. His email address is *mike@towerseekers.com*.

Church Antennas: Blessing or Curse?

Antennas find happy homes in some churches but rejection in others. What pleases parishioners in one area can anger those in another. Unpredicted, adverse reactions took some church leaders by surprise.

by J. Sharpe Smith

Mix cell antennas and churches and what do you get? Everything from small blessings to what some might call miracles. But you have to leave space in the pews for controversy and a fair amount of conflict. Religion and cell towers can produce plenty of that on their own.

With the help of $400,000 in leasing fees over five years, an urban Dayton, Ohio, church has launched a public charter community school for learning disabled children and a facility for infant day care. Plans exist for another infant day care center to be built and a special park for children. The church employs 30 people in the care of more than 300 children.

"It has made us excited about our mission and what we can accomplish and has done amazing things for children's lives," said Rev. Tim Forbess, First United Methodist Church. The church, which hosts antennas from five wireless carriers, has dedicated the antenna space rental income to fund new mission work in the community.

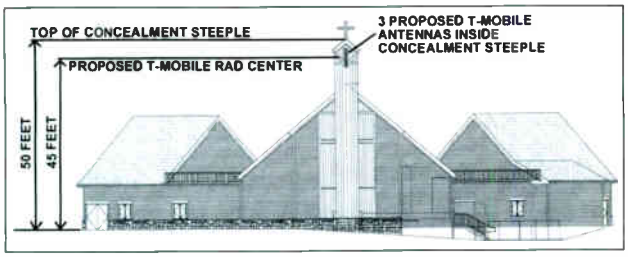
Dr. Roger Johns, pastor of St. Mark's United Methodist Church, was naïve to the fear that parents of children in the church's nursery school have of cellular antennas. One-third of the children may be pulled from the school if the antenna is deployed.

'We began to get a lot of unfriendly remarks from our neighbors' —Dr. Roger Johns

The goals of a small church located 30 miles southwest of Washington, D.C., in Woodbridge, Va., are more modest but no less essential. The church of 300 was built two and a half years ago with a diminutive budget and lacked a steeple and adequate landscaping.

Occoquan Bible Church

When the local water authority decided against allowing a sixth cell antenna on its water tower, T-Mobile approached nearby Occoquan Bible Church, which was built on a rise, offering to build an antenna concealment at the church that would look like an ordinary steeple. The steeple would be made from the same materials and architecture as the existing



A church of 300 built on a shoestring budget, Occoquan Bible Church was pleased when T-Mobile offered to build a concealment steeple on the church that would house a cellular antenna. The cellular carrier anted up $2,500 for landscaping on top of $1,000 a month in leasing fees. Above is the blueprint of the new structure. Photo: T-Mobile

church, rising only 12 feet taller than the existing roofline.

"Parishioners met and decided that the look of our church was sort of vanilla, and a steeple would help identify us," said Christopher Hazen, church member and project manager for constructing the church. "When T-Mobile gave us this opportunity, it was exciting."

The cellular carrier also gave the church $2,500 to be used for landscaping, which is expected to please the local community. The church will receive $1,000 a month in leasing fees, which Hazen plans to put to good use providing for the upkeep of its physical facility.

Emotional opposition

As well as bringing in badly needed cash, building a cell tower can also bring out emotional opposition. T-Mobile's efforts to build a cell tower in suburban Akron, Ohio, pitted neighboring churches against each other.

The stakes are high. The proposed 140-foot monopole tower could potentially bring in $15,000 to $30,000 in leasing revenue for Faith Lutheran Church, which counts 250 in its membership. But it has also brought out the ire of neighboring St. Hilary Catholic Church, which has 1,500 members and a school. The reasons are typical of most cell tower opposition: the visual effect and a fear of RF radiation. Since the plans went public, a bitter war of words has ensued over the importance of the money and the safety of children in the school.

For a Rockville Centre, N.Y. church, a proposal to lease space in its steeple for a concealed cellular antenna has felt more like a curse than a blessing. St. Mark's United Methodist Church plans to apply the leasing proceeds to upkeep on its facility, which is used to support the community, but the cost in community relations may be much higher.

When the community found out about the proposed concealed cellular antenna, the immediate feedback was negative. Threats by parents to pull their children from the church's school caught the church off guard.

"We began to get a lot of unfriendly remarks from our neighbors," said Dr. Roger Johns, pastor of St. Mark's United Methodist Church. "I was naïve to the fear that people still hold on to about cellular antennas. I have heard there is a greater tolerance for cellular antennas, but not here."

Community relations are highly important to the church of 500. Forty individual groups ranging from Alcoholics Anonymous to yoga classes meet in its facility.

Threats by parents to pull their children from the church's school caught the church off guard

"We are much beloved in the community and that is something we are proud of," Johns said. "In one fell swoop, we can ruin it. That is a very strange feeling." As of press time, T-Mobile was planning to do more education in the community.

In New Jersey, the fear of RF emissions led the board of trustees for a church slated for a cell antenna in its steeple to ask T-Mobile to cut the power in half. The cellular carrier has agreed to the request from the church, which has a pre-kindergarten school, and it looks like the project will move forward. agl


GENGRAS STUDENT UNION BUILDING

University Course Uses Wireless Tower Example

The next generation of engineers equipped to design and build wireless telecommunications infrastructure is in school today. Here's what one university offers to help graduate engineers handle multi-disciplinary projects such as cell towers.

by Don Bishop

Engineering students at the University of Hartford in Hartford, Conn., take part in an unusual opportunity when they sign up for course ES 342, Engineering Practice, taught by Professor Ladimer S. Nagurney.

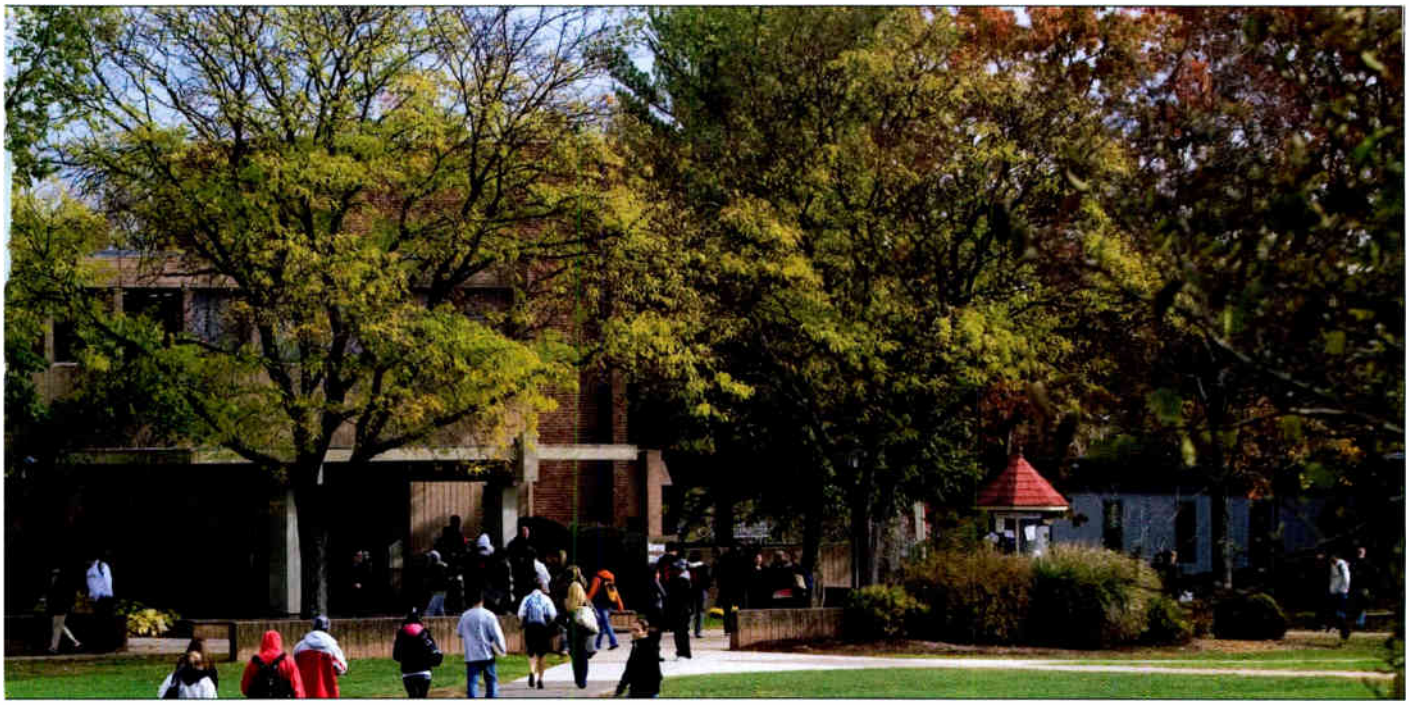
The course is a study of the engineering process from conceptual design to the release to manufacturing or construction. Students learn about feasibility studies, financial viability, environmental impact, societal concerns, licensing and satisfying regulators. If that sounds similar to telecommunications tower development projects, it is. In fact, at least once when the course was taught, the construction of a cell tower was the subject of the class project.

When tower development executives ask where the next generation of engineers prepared to undertake wireless telecom projects that cross multiple engineering disciplines will come from, the University of Hartford is providing part of the answer.

During the 2007–2008 academic year, when AGL spoke with Nagurney and exchanged email with one of his students, Jonathan Silver, the class subject involved a sanitation project.

Silver was candid in his assessment. "ES342 was definitely comparable in real-world experiences to my internships; it even came complete with bureaucracy and stubborn engineers. There was one group who refused to change their component even when everyone else had made their plans according to a different [crucial] design," he said.

"Overall, we were given a project and turned loose to run the show ourselves, with Dr. Nagurney acting only in an advisory position. There were definitely strengths and weaknesses that developed in each of the groups. One of the biggest issues we had to overcome was that we had to collectively manage the project since the designated project



management group didn't do anything except to prepare the report at the end. Also, the class allowed me to explore design work in an area outside of my major," Silver said.

The course is required for junior students majoring in civil, electrical or mechanical engineering. Students who complete the course are expected to be able to understand the structure and development of a large engineering project, work toward a common goal with students of other disciplines and understand the role of presenting engineering design and analysis to the general public. That last point reminds one of wireless carrier engineers who give presentations and answer questions at zoning meetings.

Here is what Nagurney told us about the course and how his students may eventually fit into engineering jobs in the wireless industry.

AGL: *What do companies in the wireless industry tell you they want from the university's engineering program?*

Nagurney: They want students who are technically competent. In the main, everyone says that's the most important thing. On the other hand, you want students who have an ability to work in multi-disciplinary situations. They do not do the whole system design themselves.

If you think of wireless infrastructure, you're thinking electrical engineering, civil engineering, mechanical engineering and other disciplines. You need a civil engineer who is a registered professional engineer to certify the plans and show that the tower will stand up, and an electrical engineer for the antenna, and a mechanical engineer for the brackets and pieces to hang the antennas on and the HVAC for the shelter.

We want to graduate engineering students who can work on this kind

Student Jonathan Silver

Choosing engineering seems like a natural fit. However, when graduating high school I wasn't particularly sure. I always had a knack and interest in math and science, physics especially. It was because of my musical interests that I found the acoustics program at the University of Hartford. The more I've delved into the engineering the more I've realized how much I enjoy it, including areas outside of the mechanical umbrella where acoustics falls. Being at a smaller university and having classes like ES 342 was what allowed me the opportunity to explore areas that normally wouldn't be covered in my mechanical classes.

As far as work and future plans, so far I've completed two internships — one in architectural acoustics, and the other in helping to develop an acoustics program at a telecommunications company. Next fall I will be continuing on in my studies pursuing a Ph.D. in experimental fluid mechanics. My interests are in flow-induced vibrations, aeroelasticity and aeroacoustics.

—Jonathan Silver

of team. We want to graduate students who are sensitive to social and political implications of their designs. That's important, because if the political aspects aren't met, most wireless infrastructure projects won't get off the ground.

If your engineer says the wrong thing before a zoning board, that puts an end to the project. You can't communicate the technical aspects to the intelligent political bodies, they don't want to hear the third decimal point, but they want to be reassured that the next generation won't be born with green skin and property values won't go down by 50 percent because there's a tower in the backyard.

We have had several students who have gone on to one of the major wireless providers and they are doing extremely well there

We want to graduate students who understand more about how their designs are affected by economics and have management skills so they understand that you have to include the economic aspects of the design, both long term and short term.

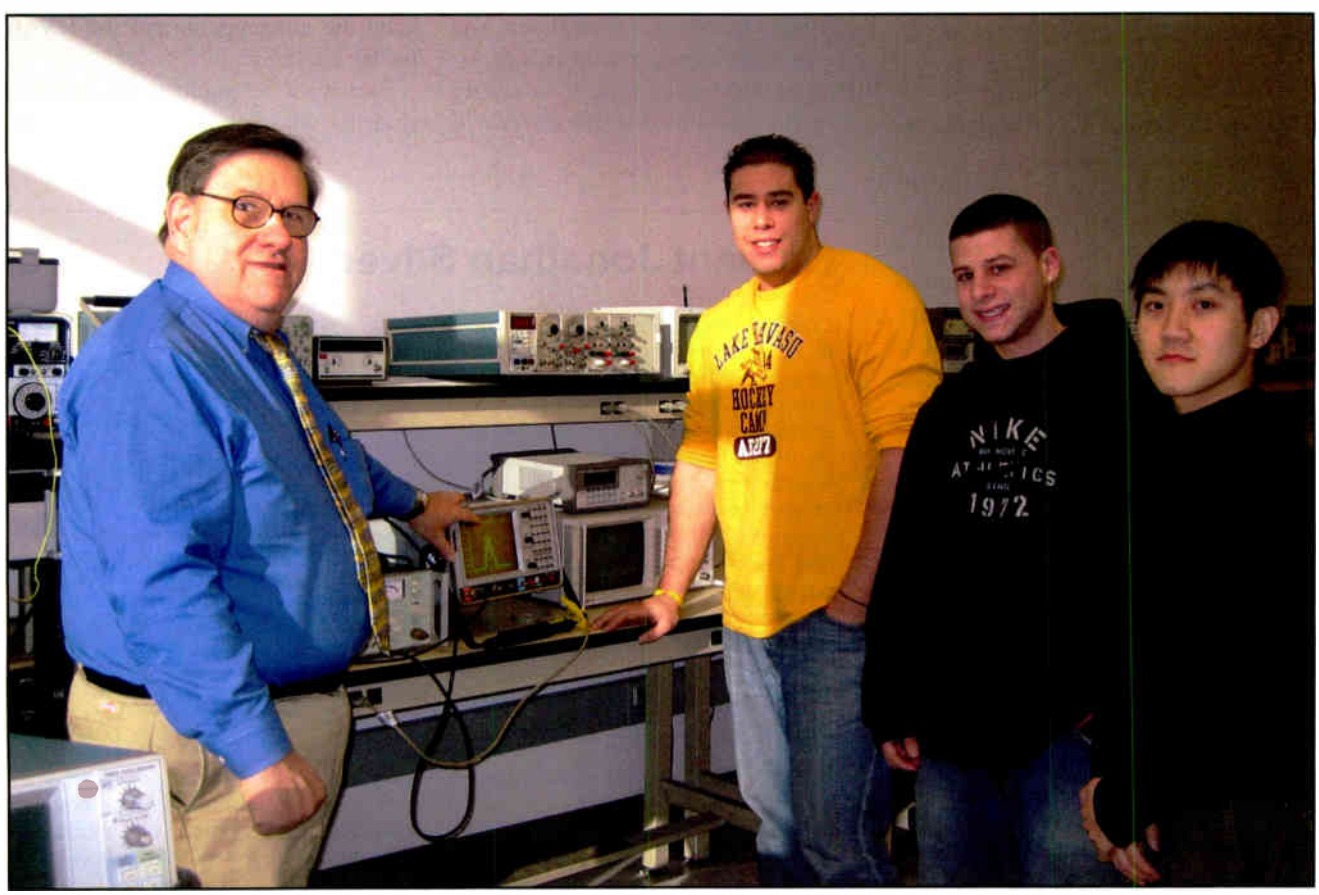
In the short term, they need to understand how much to build right away. In the long term, they must understand how much it will cost to maintain, how much to replace, and what the warranty costs could be. These are all aspects that could affect your bottom line but are not aspects you might think of right away.

The graduates need to understand that if you build something with 50 percent failure, you're losing money and some of your reputation. It's also a failure for the company because you lose credibility in the industry.

In many cases, when we've had dealings with representatives of industry, they indicate what they want as an attribute in a student right now so the student can make them money immediately. Can the student use this software package that fits this project? That's important, but on the other hand, universities don't have every possible package and every possible product, which means that when we deal with a lot of industries, we have to remind them that we educate engineers with a broad perspective, and that with minimal training on the company's part, they would fit in. We don't train people for "this job" and "that company."

That's the difference between university education and industrial training.

Opportunities abound for students who see infrastructure offering poten-



Professor Nagurney with electrical engineering undergraduate students Brian Fluss, Thomas Casasanta and Curtis Ng in the University of Hartford Communications Laboratory.

tial jobs not only for electrical engineers, but all engineers, whether the infrastructure involves telecom, roads or pipelines, for example. Infrastructure will provide engineering jobs in the next few years and probably for the long term.

We have had several students who have gone on to one of the major wireless providers and they are doing extremely well there. We had a couple who went on to government laboratories and have done extremely well there.

We have a broad-based group of companies in the Northeast. Most students don't secure jobs in infrastructure because many would rather work in the aircraft electronics or aircraft industry, which is big around here.

We have several who formed their own firms for doing acoustical consulting for noise problems and that type of work.

The University of Hartford Integrated Science, Engineering and Technology Complex in West Hartford, Conn.

AGL: *Do you receive money from industry?*

Nagurney: There is some money flow. It is not as much as we would ike. We have had modest success, mostly with relatively local companies. There are several major companies that are local to the university. There is an opportunity for tower owners to connect more.

In the course Engineering Practice, where all the juniors in all fields of engineering work together on a project involving public safety, political and socio-economic considerations, at times I have the students design cell site towers. That subject offers something for all engineering students, so we had electrical, mechanical, civil and biomedical engineering students. I had a lot of trouble getting specific information from the tower companies. They would refer me to their lawyers when I wasn't looking for information that was sensitive. There was distrust that I might be consulting for someone against the placement of the tower.

They don't want to give me something that remotely could be used against a particular tower or any of their towers.

AGL: *What information would you like to have?*

Nagurney: Some of the overall site development information. We obtained a lot of the information from the Connecticut Siting Council, the government agency. It would have been interesting to hear how a major tower siting company defines a new site and what they look for in profitability and how they judge long-term profitability. How do they handle the socio-political aspects of developing a tower? How do they approach a zoning or planning board or a town political body that wants you to do a tower because of the rental fees, but doesn't want to say on the record that they want the tower built?

Most politicians realize we need a tower infrastructure — at least, the ones in the Northeast I've seen. But as politicians, they don't want to come out in favor until they hear that their local population is in favor.

Towers have a long lead time. You don't announce today and start building tomorrow. You have months and at times years of lead time before you construct.

Towers have a long lead time. You don't announce today and start building tomorrow. You have months and at times years of lead time before you construct.

A big thing in education is looking at what the engineer should be like in 2020. That's our lead time. What we have to do is to define how the class of 2020 will be different from today and what attributes we need to change today. agl

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What a Week It Was!

Monday, Tuesday, Wednesday … the announcements kept coming, and the dollars totalled more than a billion as SBA and TowerCo bought thousands of towers.

by R. Clayton Funk

It's October, and everyone has settled into fall routines. Kids of all ages are back in school; the college and professional football seasons are well under way; and the PCIA tower conference is right around the corner. But before the summer tans fade as a far-distant memory, let's reflect on one of the most memorable weeks of merger-and-acquisition activity that the tower industry has ever seen.

If you are focused on the future of this business instead of the past — and it's easy to focus on the future, given the rosy prospects of the wireless tower industry for reasons we cover here — let's take a quick time-out and relive "the week that was" in late July, starting on Monday, July 21, 2008.

Optasite Sells to SBA — Early Monday morning, news broke that Optasite, led by long-time tower industry veterans Jim Eisenstein and Jim Ross, had agreed to sell to SBA Communications for $428.2 million in stock — based on SBA's closing stock price the day the deal was announced — along with assumption of debt and a small cash component. According to press releases and analyst reports, the deal was valued at 18.6x tower cash flow (TCF) and — with 548 tower sites — a price per tower of about $781,000. With 2.4 tenants per tower, the Optasite portfolio had done a good job of attracting tenants. Structurally the towers had additional capacity remaining to hold future antennas and lines.

Deal Analysis — SBA was able to add a large number of towers using a minimal amount of cash. The Optasite portfolio, built primarily through acquisitions over the last few years, will be easily integrated into SBA's existing infrastructure resulting in minimal additional expenses to SBA. The TCF multiple and price per tower paid were consistent with the tower M&A market at the time the deal was announced.

SBA Acquires Light Tower — Early the next morning, a press release hit the news wires describing another acquisition by SBA: 340 towers and distributed antenna systems business owned by Light Tower Wireless for $245.4 million — using SBA's closing stock price the day the deal was announced — in cash and stock. According to a couple of analyst reports, the deal was valued at roughly 18.2x TCF and, with 340 tower sites, a price per tower of about $720,000. With 2.2 tenants per tower, the Light Tower Wireless sites portfolio had done a good job of attracting tenants while structurally the towers had additional capacity remaining to hold future antennas and lines.

This acquisition marked SBA's foray into the distributed antenna system business and yet another sale by a large, independent tower company joining the ranks of several others that reached a critical mass of more than 200 towers and decided to exit the business.

Deal Analysis — In full disclosure,

"We are very excited to be entering into this transaction with Optasite", commented **Jeffrey A. Stoops**, president and chief executive officer of SBA. "I have known Jim Eisenstein, Optasite's CEO, for many years as a successful tower industry executive. Jim and his team have built a quality growth company with high-performing assets, which we believe will be integrated smoothly into our company and will continue to perform well as part of SBA.."

"We are very pleased to have the opportunity to acquire Light Tower Wireless," Stoops continued, "We believe the tower assets are very high quality, with the substantial majority being built specifically for the independent tower ownership business in good locations with good structural capacities. We are also excited to make our first foray into the DAS business, which we believe will be an important niche in future wireless deployments and very complimentary to our core business of tower ownership."

my firm represented Light Tower in this transaction and so my level of analysis is limited by confidentiality. The acquisition clearly gives SBA a new presence in the distributed antenna system niche, putting them in direct competition with their public tower competitors American Tower and Crown Castle. The divestiture of the towers and distributed antenna system business allows Light Tower to focus 100 percent on its existing fiber business. Similar to the Optasite deal, the TCF multiple and price per tower for these types of sites was consistent with the tower M&A market at the time the deal was announced.

Sprint Nextel agrees to a sale-leaseback with TowerCo — Just as the tower industry was full of deal chatter from the first two deals announced that week, Wednesday saw the final and biggest deal of the week: Sprint Nextel's sale of 3,300 towers to TowerCo for $660 million. While few details were released other than the high-level details — and a price per tower of $203,000 — it was estimated by many in the tower business that it is unlikely Sprint Nextel would have sold their sites for less than 20x TCF. Also unknown were the average number of tenants on the towers but most carrier portfolios have averaged fewer than 1.5 tenants, including the anchor carrier.

Deal Analysis — Let's assume several things: The towers were built to hold at least three tenants on average, the towers had fewer than 1.5 tenants per tower, and Sprint Nextel agreed to pay a "market" leaseback rate of at least $1,500 per month. Assuming these items, the deal was certainly a "win" for TowerCo from a pure price-per-tower standpoint and Sprint Nextel got an all-cash buyer without any sort of announced financing contingency, something they needed given the turmoil of the credit markets. If TowerCo averages "market" lease-up rates on the 3,300 towers over the next three-to-five years and then decides to sell the portfolio to a larger company, TowerCo and its investors should be happy with the resulting sale.

What does it all mean?

As a tower owner who may be a potential seller in the future you have to appreciate how M&A deal multiples have remained strong despite the rest of the business world making daily headlines about uncertainty in the credit markets, the high price of oil and the fact that the U.S. economy is in a recession. Is the tower industry immune? Certainly not.

Taking a look at the big picture, any number of things could stymie the U.S. economy and affect not only the tower business but many other facets of the economy as well. Any sort of world conflict that threatens to further draw the U.S. military into action could put more of a drain on consumer confidence and tax the nation's resources. The longer the subprime mess takes to unravel and work its way through the system, the more it will continue to suppress the financial market's ability to recover any time soon. Although the growth story for the tower industry remains strong and consistent, it's still affected by other macro-factors.

Additionally, the tower business is a capital-intensive business. If capital, in the form of equity or debt or both becomes difficult to access, the tower industry could hit the skids as it did back in the early part of this decade. Perhaps more importantly, the financial health of the carriers is a situation that needs to monitored closely. If, for whatever reasons, wireless carriers can no longer access money to invest in coverage or capacity or both, you would see a rapid scaling back of infrastructure investments; namely, a reduction in tower leasing activity.

Another dynamic to which many entrepreneurs are paying close attention is what the two contenders for president of the United States are saying regarding their tax plans. Long-term capital gains rates are at a historic low and speculation is that they are likely to rise no matter whether a Democrat or Republican is elected. The Democratic candidate has said he supports raising capital gains rates significantly higher than the Republican candidate, resulting in higher taxes upon the sale of assets or an entire corporate entity. Either way, it behooves a seller to consider the short- and long-term consequences of changes likely to result from the election year and the fact that either candidate, upon election, is likely to want changes to the tax code that would affect business owners and shareholders.

Overall, however, the future remains bright for the tower business. Despite two larger mid-tier tower companies exiting the business, there remains a dynamic, robust and growing private equity-backed contingent of tower companies that will

"These are great towers concentrated in large metropolitan markets throughout the U.S. and will benefit as wireless communications continue to grow." said **Richard Byrne**, TowerCo's CEO.

"We're happy that Light Tower Wireless will continue to flourish under SBA leadership. We think the potential continues to be strong for the business," said **Doug Wiest**, CEO of Light Tower.

Meet the players

TowerCo was founded in 2004 by Tailwind Capital and industry veterans Richard Byrne, chief executive oficer, and Scot Lloyd, chief operating officer, to meet the infrastructure needs of wireless service providers by developing, owning and leasing communication towers. Soros Strategic Partners invested in TowerCo in December 2005. Currently TowerCo has exclusive contracts to build towers directly for carriers throughout the U.S. TowerCo is based in Cary, N.C.

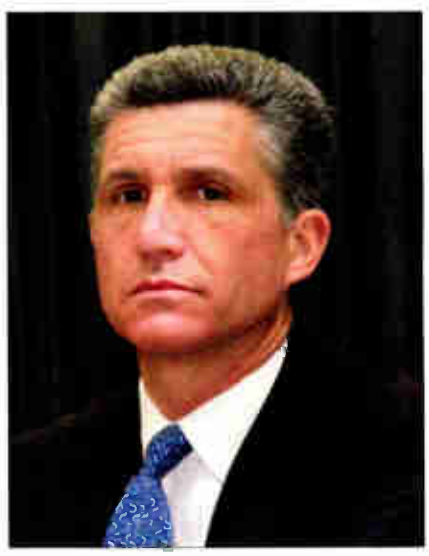
SBA Communications is a leading independent owner and operator of wireless communications infrastructure in the United States. SBA generates revenue from two primary businesses: site leasing and site development services. The primary focus of the company is the leasing of antenna space on its multi-tenant towers to a variety of wireless service providers under long-term lease contracts. Since it was founded in 1989, SBA has participated in the development of over 35,000 antenna sites in the United States.

Headquartered in Westborough, Mass., **Optasite** is one of the fastest growing tower companies in the United States, focusing on a strategy of disciplined tower acquisition and development. Optasite is funded by leading financial investors, including Babson Capital Management, Centennial Ventures, Citi, Columbia Capital, Goldman Sachs & Co., Highland Capital Partners, Key Venture Partners, Long River Ventures, Point Judith Capital and Village Ventures.

Sprint Nextel offers a comprehensive range of wireless and wireline communications services bringing the freedom of mobility to consumers, businesses and government users. Sprint Nextel is widely recognized for developing, engineering and deploying innovative technologies, including two wireless networks serving nearly 53 million customers at the end of the first quarter 2008; industry-leading mobile data services; instant national and international push-to-talk capabilities; and a global Tier 1 Internet backbone.

Lightower was formerly National Grid Wireless, a wholly owned subsidiary of National Grid. In May 2007, M/C Venture Partners and Wachovia Capital Partners joined together to purchase the business from National Grid. The name was changed to Lightower to better communicate the company's business and vision for its future. Lightower delivers turnkey access to over 350 communications towers, over 2 million electric distribution poles, existing multi-carrier DAS networks and more than 525 substation locations where the company can build towers. Plus, the company has over 1,100 available route miles of fiber-optic network, three carrier-class data centers, and managed fiber backhaul services.

"By leasing rather than owning these network facilities, we can better focus on our core business of providing communications services to consumers, businesses and government customers," said **Bob Azzi**, senior vice president, Field Engineering and Operations, Sprint Nextel. "Significantly, this transaction provides Sprint Nextel with additional liquidity which gives us greater flexibility in managing our company."



"It is a wonderful opportunity for us to create a win-win scenario," said **Jim Eisenstein**, CEO of Optasite. "We are putting into the hands of SBA some immature assets that have shown tremendous growth. We expect them to continue to show continued growth. At the same time, we believe it is a very good deal for our shareholders in terms of creating significant value over the last four years."

benefit from two build-to-suit competitors leaving the market. By nearly all accounts in polling various tower owners, the potential carrier build out in late 2008 and 2009 is as promising as it's ever been. With the exception of a couple of hiccups from a limited number of carriers, the wireless business continues to grow in terms of subscribers, minutes of use and revenue per user. And, despite gas prices being at the highest level they've been since the high prices of the early to mid-'70s, do you ever hear about people eliminating their wireless phone to save money for gas and other expenses? If so, it's few and far between. Being "wireless" is a way of life for two or three generations and having mobile access will continue to be a "must" rather than being viewed as a discretionary expense.

No matter what happens, the tower merger-and-acquisition marketplace will be hard pressed to match the week of July 21st in terms of number of sizeable deals and the rapid-fire sequence of the announcements. agl

R. Clayton Funk is managing director of Media Venture Partners, San Francisco. His email address is *cfunk@mediaventurepartners.com*.

(*continued from page 8*)

(Radio Amateur Civil Emergency Service) services. I've been participating in this group — visit *www.w4ava.net* — and these are first-class guys, with a great mission and direction, and some great support from Arlington County to make it all a reality.

One question radio amateur groups such as the RACES group ask me is, "Could you ask (*insert name*, such as American Tower, Crown Castle and SBA) if we could put a repeater on their tower?" My usual answer is "Hell, no. These guys are vertical real estate companies, and if you don't add to the bottom line and help the multiple, the answer will be 'no.'"

However, the tide may be turning a little. We've always had a difficult time balancing the requirement and sometimes the desire to be good citizens with our fiduciary responsibilities. You can't let a municipality take up too much tower space for free, but we also can't say "no" to every non-paying tenant. Where is the balance? I don't know. You probably don't, either.

I would like to suggest that we take a more assertive role in helping to identify which assets we have that could be used in times of need, and which could routinely be used for exercises and on a more regular basis. Perhaps there could be a liaison person established in the operations sides of our companies to try to facilitate some public service. I know there are cells on wheels (COWs) out there that could have been deployed to help many folks, and other resources of our industry could go a long way toward helping emergency operations. agl

A Pepco 100-foot crank-up tower serves the emergency repeater.

Fighting a fire in the Great Dismal Swamp called for radio communications from the fire line to ground-base firefighters.

IP Makes the Difference With Micro Base Stations

IP-based coverage and capacity solutions lead the radio access network revolution for residential, enterprise and outdoor applications.

by Hilton Nicholson, as told to AGL

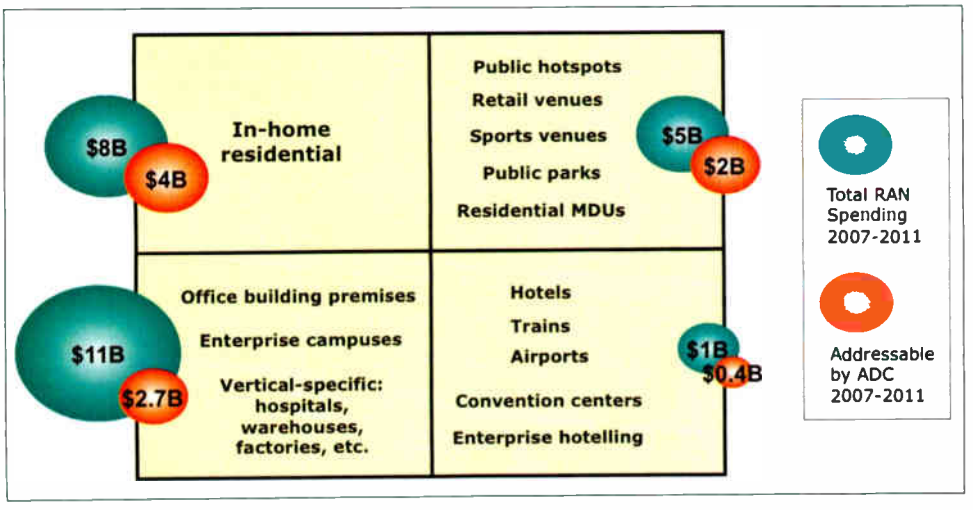
In a conversation with AGL, the president of ADC Network Business Solutions, Hilton Nicholson, explained his company's approach to RF signal distribution in support of wireless telecommunications carriers.

When you look at the radio access architecture for outdoor distributed antenna systems (DAS) or in-building wireless systems — another form of DAS — it is about distributing RF signals. Long-term, capacity should be placed at the *end point*: a *pico base station* feeding a DAS.

A *femtocell* supports four to five users with 2 Mb/s and upward of data bandwidth. Femtocells are small base units with a target price of $100. Sprint is the first to deploy femtocells in the United States.

Picocells serve about 50 users. Almost every Starbucks coffeehouse has one. Think of it as covering a small enterprise. You have multiple picocells and plug them into your data port in your building. They are about the size of a desktop telephone. You hang one on the wall, plug it into the local area network jack in your office, and you have five bars (a strong signal) for about 50 users. The picocell is IP-fed, so the key thing that wireless carriers in the United States like is that the Internet connection provides the backhaul for no additional cost. Overall, backhaul accounts for about 35 percent of their network operating expense (opex).

The shift now is away from distributing RF to pushing capacity and coverage to the edge of the network. Because these base stations are fed over IP, you get free or low-cost backhaul. If I want to cover a small enterprise and I put up a picocell, I get coverage and capacity without spending a dime on backhaul. Many carriers are moving this way. If you can't get zoning approval for a macro site — and these picocells are "stealth," they are in-building — then the low-cost backhaul is a competitive advantage for the carriers.



ADC anticipates capturing a sizeable portion of the radio access network market, whether indoor or outdoor.

RAN overview

In the outdoor radio access network market, large macro cell players such as Nokia-Siemens, Alcatel-Lucent and Ericsson are selling upward of $46 billion of consumer capacity solutions and $11 billion of enterprise capacity solutions through the deployment of traditional, large cellular towers and base stations. That market is established with players in place.

The in-building enterprise segment is an $11 billion market, including both active and passive systems. The active side of the segment is growing 33 percent a year.

On the consumer side, a $4 billion market is emerging for femtocells and picocells. For example, in my home, I have one or two rooms where I can truly use my cell phone because I am on a hill, away from a cell tower. If I move around while using the phone, it drops calls. I can bring a femtocell home, plug it into a spare port on my access point, and then I can support five users in my home and we all get five bars. This is a huge, growing area, expected to hit $8 billion at least by 2011.

Another area includes airports, malls, multi-dwelling units and casinos. In these areas, sometimes a combined solution is used that has an in-building system for inside and a DAS for courtyards and around the pool. Special venues require hybrid solutions, as would a college campus, with a combination of outdoor and in-building solutions.

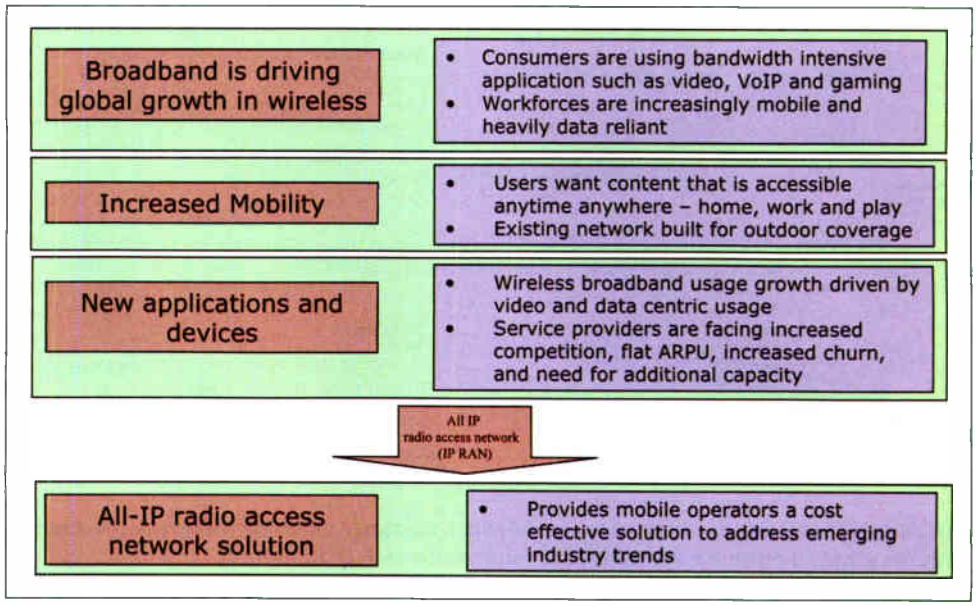
Global growth

Broadband is driving global growth. Everyone has BlackBerries. I'm the only one in my family without an iPhone. There is a lot of Web surfing from the iPhone and other devices. Workforces are more mobile and using a lot of data to stay connected. Everyone wants their information wherever they are.

New applications require a lot of data. The only way to carry the data is to put additional capacity in the network. There is a traditional way — to build a new macro cell tower. But again you will have issues involving penetrating walls, and many calls are originated and terminated inside buildings. Putting up more macros won't help. Put coverage and capacity at the end of the network. If you need coverage and capacity in an enterprise or college campus, put it there.

How do mobile network operators provide residential capacity, and what do they do with large enterprises and holes in their coverage outdoors on campuses? Femtocells address that question. You plug a femtocell into a DSL router in your home, and you get five bars in your home. For a small enterprise, a small-capacity unit plugs into the Ethernet in your workplace, and it is powered by the Ethernet cable — which is called PoE, or "power over Ethernet." It covers as many as 50 users.

But you couldn't put picocells all over the place in a large enterprise such as a facility with 500,000 square feet. Placing enough picocells there would cost about 30 cents per square foot of coverage. With DAS you can provide coverage at about 12 cents per square foot. But DAS used by itself requires backhaul. So you take the same picocells you would use in a small business and use them to drive the DAS, allowing for backhaul over IP, and you get the coverage for a large facility down to 9 cents per square foot. The combination is right for an enterprise because they don't have to pay for a base station hotel; they can put picocells in the enterprise.



Industry trends indicate mobile operators need to migrate toward the all-IP radio access network solution.

DAS only provides coverage. You have to feed it with something. But it is the best way to distribute RF in the enterprise. If you need capacity, the only way is with a giant base station — or — deploy multiple picocells for the capacity. You feed the DAS with picocells for coverage at about 9 cents per square foot.

If these picocells cost $5,000 — and you could cover a doctor's office with that — then at 500,000 square feet, that would be a $2 million system. But if you were to put picocells all over the place, it would take a ton of them on multiple floors. To cover that much space requires a lot. If you use DAS, a little antenna that covers the same areas fed by the DAS is maybe $100 to $200, and sometimes as little as $75. The price point is lower than a picocell, so it helps to use DAS to distribute the signals.

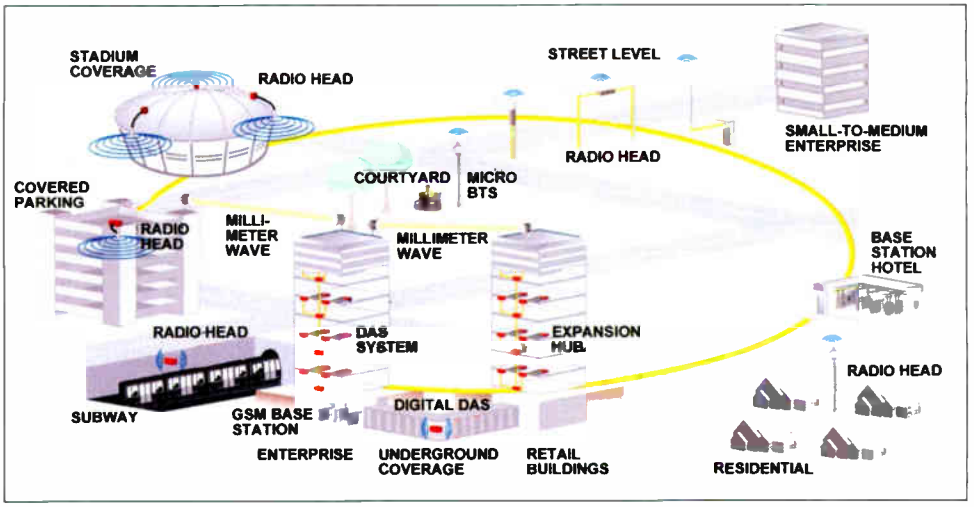
You can use one picocell on each frequency band, A, B, C and D, and distribute that throughout the building to meet the capacity needs, with the option of splitting the signals. Some parts of the building may be empty. By having that capacity available throughout the building, you have the option to have it wherever the capacity needs are.

A cheap combiner/splitter feeds the DAS, and you have multiple picocells serving as base stations, and the DAS distributes the signal throughout the building. As capacity shifts, you don't have to worry because all the capacity is available all through the building.

The only paradigm shift is that instead of having the big base station in the basement or a base station hotel feeding the enterprise, we put the capacity in the basement and use IP to get back to the service provider.

A compelling example involves an outdoor DAS unit, which to distribute the RF requires about 1.5 Gb/s to 3 Gb/s of throughput. That's just to distribute RF. When you look at the RF, the actual payload is about 1 Mb/s to 2 Mb/s of information.

By going over IP and not RF, the bandwidth needs drop significantly with the picocell in the basement that



ADC's Internet Protocol radio access network strategy calls for integrating picocells with distributed antenna systems and femtocells with IP backhaul.

converts it to RF. By using IP, it is 1 Mb/s versus 1 Gb/s, a factor of one thousand. There is a significant bandwidth saving if you don't convert the traffic to RF until you have to. And we don't want to convert to RF until we absolutely have to. Keep the traffic in native voice and data over IP because the bandwidth requirements are less, and convert to RF when you have to.

The value proposition for a carrier is so high, they want to listen. We've talked about residential coverage, and outdoor is the same thing. We can take DAS and distribute signals all over the place.

An IP-fed micro base station with a cable modem can be placed anywhere, even on a pole. The bandwidth requirements are so low, 1 Mb/s to 2 Mb/s, that WiMAX can provide backhaul. Such a micro station can extend coverage anywhere in a village, and even on an island, with backhaul over satellite. The bandwidth is so low, it is economical to provide such coverage.

The whole movement to IP changes the dynamics of the radio access network. The movement to IP has happened on the network side. It is just slow to take hold in the radio access network.

Micro base stations could provide coverage for stadiums, parking decks, residential coverage and capacity. Solutions are available where the antennas are placed in light poles and where they are near them, or in places where macro site zoning is impossible, yet a micro base station box can be placed to extend capacity and coverage in those areas.

We're looking at leased data systems on airplanes — no voice calls, only BlackBerries. I'm OK with everyone doing data, but I would hate to have people on airplanes making phone calls.

IP story

The compelling thing is that IP is making it into the radio access networks. An analogy we use is to compare it with the mainframe network. The "iBunch" (IBM, Burroughs, Univac, NCR, Control Data and Honeywell) owned the mainframe computing market. Often they were attacked by DEC, which came out with minicomputers. DEC quickly grew to be huge. The next thing that happened was little guys like Apple and others were

ADC Leverages Internet Protocol

ADC's goal today is to lead the market for network infrastructure, building on our strong heritage in that area. We seek to be global leaders in some segments such as fiber-based broadband or FTTX. Carriers are now considering the many advantages of deploying fiber, and we are assisting them with that transition.

We also want to focus on the whole wireless market, indoor and outdoor, as it relates to enterprise, residential, campus and public facilities markets. We are not focused on the macro. We don't compete head-to-head with the big players. We look for areas that the macro network doesn't cover: in-building, urban canyons and rural canyons that need hole coverage and capacity.

Hilton Nicholson

With the acquisition of LGC and the products we already had prior to that, we have become No. 1 in active in-building coverage. We are No. 2 in the overall industry with passive and active systems together, because there are a lot of passive systems out there. We have a patent on a digital DAS solution and we are the only vendor providing that. It was invented here. We are No. 1 in pure digital outdoor DAS. We have more than 11,000 in-building and outdoor DAS systems deployed globally.

With in-building DAS, there are a lot of competitors. When you look at outdoor DAS, the list drops off. And when you start adding IP base station capacity and switching, you get to ADC. We have millimeter wave, WiMAX and wireline backhaul solutions.

If you have a campus with indoor and outdoor coverage and you need backhaul, no one has as complete a solution as ADC. By pulling these solutions together, we definitely believe we have a competitive advantage over anyone in this market.

We differentiate ourselves by leveraging Internet protocol.

—Hilton Nicholson

coming out with personal computers. The big companies didn't react to the personal computer.

The reason the big companies have not embraced IP radio access network today is because it threatens their core business. They sell $57 billion in base stations and controllers. So what happens when it comes to small base stations for $100 for your home and $5,000 for small businesses? They can't go there.

This opens an opportunity for people to consider IP radio access network. First, the cost is lower, and second, it reduces opex for backhaul. These are the PCs coming into the market these days. What makes it possible today when it wasn't possible when the mainframes handled computer power is the Internet. It flattens the entire network. This is what we need to capitalize on. We couldn't do this without the Internet.

We have created the PCs of the new network. I believe the carriers actually see the advantages of IP. And we are selling products that any carrier worried about backhaul would want in order to leverage IP. They have a huge network of routers to carry traffic, and this is just an extension of it into the radio access network.

Future for carriers

With the macro sites, it's hard to get zoning approval. No one wants a tower in his or her neighborhood. That's one issue. Even with the Advanced Wireless Service spectrum that was awarded at 1700 and 2100 MHz, those higher frequencies will have trouble penetrating walls. You still will have trouble in buildings, even if you put up a tower.

With consolidation such as AT&T and Cingular, you're seeing in some cases that there are *too many* towers. They are tearing down towers. The tower industry is going to undergo a significant transformation. The substitute technology to towers is what we just talked about. Moving that capacity to where it is needed will help reduce the number of towers that need to be built to handle coverage and capacity.

The first cost for picocells and femtocells is a lot lower than the cost of a tower. I think we will see a slowdown in macro tower deployments and significant growth in capacity and coverage where it is actually needed. If it is needed in the home, you provide a femtocell. In an enterprise, you provide an enterprise IP-fed system feeding DAS. Outdoors, you deploy a micro IP base station.

If you think about the computer industry and how it has evolved, the same thing is true of the wireless network. The key is leveraging IP and putting capacity and coverage where it is needed. agl

Green Cell Sites Help Carriers Limit Expenses

Efficient use of electricity not only benefits the environment, it also helps carriers reduce power consumption at cell sites that now may run to more than five times that of the average home. Efficiency translates into reduced — or more slowly rising — operating expense.

by Edmund Wilson

Cellular carriers have always sourced, implemented and managed power at their cell sites — but power is no longer quite so simple. Nations want to curb their greenhouse gases, citing global warming. Oil prices have reached historic highs, causing price inflation throughout the supply chain. An unlikely pair, Al Gore and T. Boone Pickens, wants the United States to become energy independent ASAP. The venture capital community poured $873 million dollars into investments in clean, green technologies during the first quarter of 2008, according to Cleantech Group, a network of investors.

So what does "green" mean for carriers and tower owners? Most cellular carriers do not focus on reducing their carbon footprints for the sake of being better global citizens. Instead, for carriers, emissions reductions are a positive, ancillary byproduct of reduced energy use. The primary goal is clear: Spend less money.

The first step is to address existing gear. Is it as energy efficient as possible? How much would it cost to buy more energy-efficient gear? The second step is to identify useful alternative energy sources.

With existing gear, the primary focus is on how to reduce the electricity consumed. Carriers and equipment providers have been working together to come up with new solutions for network design and site efficiency — and also alternative energy solutions, but more about that later. Nokia Siemens has stated it intends to reduce power consumption in its GSM base stations by 20 percent in 2010. For 3G gear, Nokia Siemens believes a 40 percent reduction is possible. Ericsson has similar efforts under way and is continuing to drive electricity usage down with its 3G gear.

A critical part of energy efficiency lies in optimizing the network design. Every base station that can be eliminated is effectively a 100 percent reduction in site energy expenses, a big win. The drive toward energy efficiency via reducing site count introduces some additional constraints on the design as

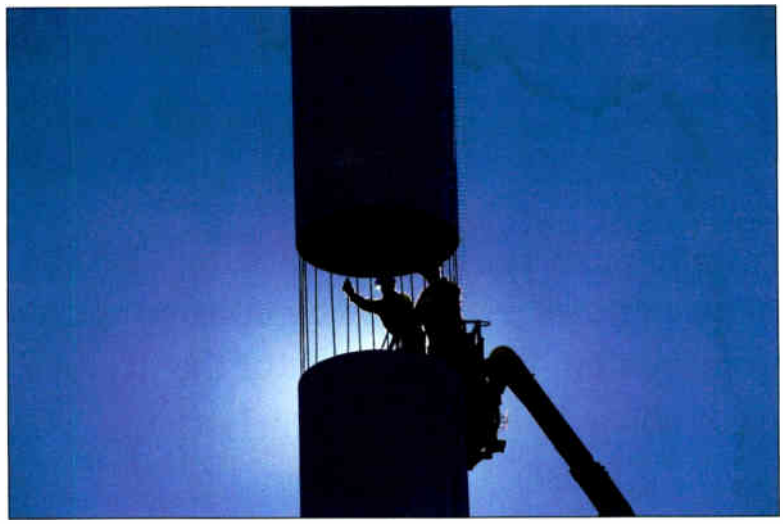
Carrier Power Consumption

Here's a figure that might be surprising. According to ABI research, North American carriers, on average, consume 62,000 kilowatt-hours per year for each cell site installation, which costs about $6,000. To put this consumption figure in perspective, the average U.S. single-family home consumed 11,965 kilowatt-hours in 2003. Each carrier is consuming electricity equivalent to what five or more homes might consume, and doing it within a much smaller footprint that could well be less than 200 square feet.

Actual electricity costs can vary widely from the average of roughly 10 cents per kilowatt-hour. In Kentucky and Virginia, coal-producing states, the cost may be half as much. Carriers could be paying twice the average in Hawaii and California.

U.S. electricity prices have been rising 3.8 percent per year, so there's no relief in sight. Because prices are a function of either regulated bodies or supply-and-demand factors well beyond the carrier's control, they become particularly difficult to forecast and manage.

Meanwhile, carriers have enjoyed some success in obtaining better rates. One major carrier did a study and realized it wasn't receiving the best possible rates because it hadn't consolidated its buying power. Instead, the carrier's local teams purchased power for each cell site, using no cohesive plan. Once the carrier understood the savings potential, it was able to negotiate bulk deals with the various utilities and not only saved money on its rates but also locked in long-term prices that ensured greater predictability.



The Ericsson Tower Tube's modular concrete construction allows rapid and cost-effective deployment. Feeders are no longer required. All equipment is safely encapsulated at the top of the tower for low feeder loss, increasing the network's coverage and capacity. It also reduces the need for cooling, thereby boosting energy efficiency and simultaneously reducing operating expense. The reduced energy expenditure means that the environmental impact is significantly less than a traditional site.

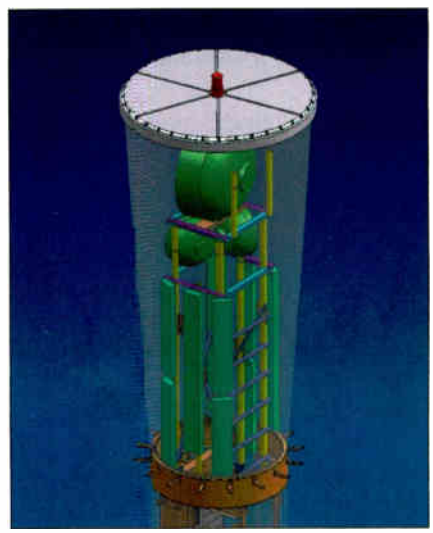
RF engineers seek to create a network with capacity to meet growing needs of data users. The engineers may be wary of limiting sites to optimize energy efficiency.

Air-conditioning equipment consumes a large part of electricity at cell sites. According to Ericsson's Patrick Le Fevre, director of marketing in the Power Modules group, air conditioning can use as much as 33 percent of the base station's overall power consumption, so reducing the amount of air conditioning required makes a big difference. Vendors are reviewing the base station design to incorporate fresh air circulation to help with cooling. They also are designing equipment that can run at higher temperatures.

Vendors are putting a lot of effort into power allocation, developing

Radio base stations are initially installed at the bell-shaped base of the tower and then raised to the top by an elevator.

Equipment designed for use indoors can be used inside the tube. A radome protects antennas. The concrete shell adds protection from vandalism and lightning.



Positioning a radio base station at an elevation inside the tube reduces low feeder loss, which in turn allows improved network coverage and capacity.

The concrete used in the construction employs post-tension reinforcement technology. This allows for thin but robust walls to be constructed, substantially lowering the amount of carbon dioxide in the manufacturing process and further minimizing overall environmental impacts. The tower can be erected in a variety of heights, shapes and styles. The exterior's color, pattern and finish can be adapted to help it fit into rural or urban settings, and win public acceptance for a new site.

systems that are smarter about traffic usage patterns and that can adjust the power consumed accordingly. Current systems waste a lot of power by not having these smarts built into the design.

Another factor affecting power use involves RF attenuation or line loss in the coaxial cables connecting ground-mounted base stations with elevated antennas. Now vendors are creating systems that move the radio unit closer to the antenna array, reducing the power dissipated in the cable feed by as much as 67 percent. Although placing radio equipment on the tower adds weight to the structure, the use of shorter, lighter cables removes some weight.

Carriers are in a race with time and escalating electricity prices. ABI Research indicates that electricity costs will continue upward until 2012, as higher rates from utilities outweigh energy efficiency improvements. But then the site costs shift downward as efficiency improvements win the day.

Much of this activity will be invisible to site owners, as many of these changes will occur within the existing footprint or actually will decrease the size of some gear. But two other options could dramatically alter the overall tower site — a new type of tower and alternative energy solutions.

By far the most radical concept for reducing the energy use and carbon footprint of cell sites is the Ericsson Tower Tube. The tube looks nothing like a conventional cell tower; instead, it's a concrete structure that incorporates the base stations and antennas into the facility. The result is a dramatic-looking structure more akin to a monument or smokestack.

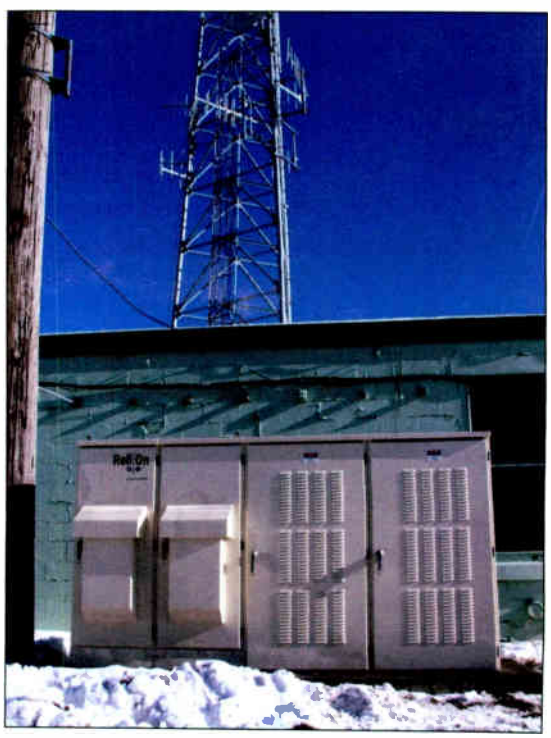
The energy benefits are derived from a few sources. The tube requires a foundation 15 to 18 feet wide. Air heated by the equipment rises through the tube, drawing cooler air up from ground level for natural convection cooling. The gear is located at the top of the structure to reduce cable-feed loss. An additional environmental benefit comes from the concrete structure itself, which has been designed in such a way as to limit carbon emissions during its manufacture.

The tube has two non-energy-related benefits: security and weatherproofing. With all equipment contained inside the tower, vandals have no view of equipment, cables, copper plates and grounding wires. Moreover, keeping the equipment inside eliminates exposure to weather, and that should extend the gear's longevity.

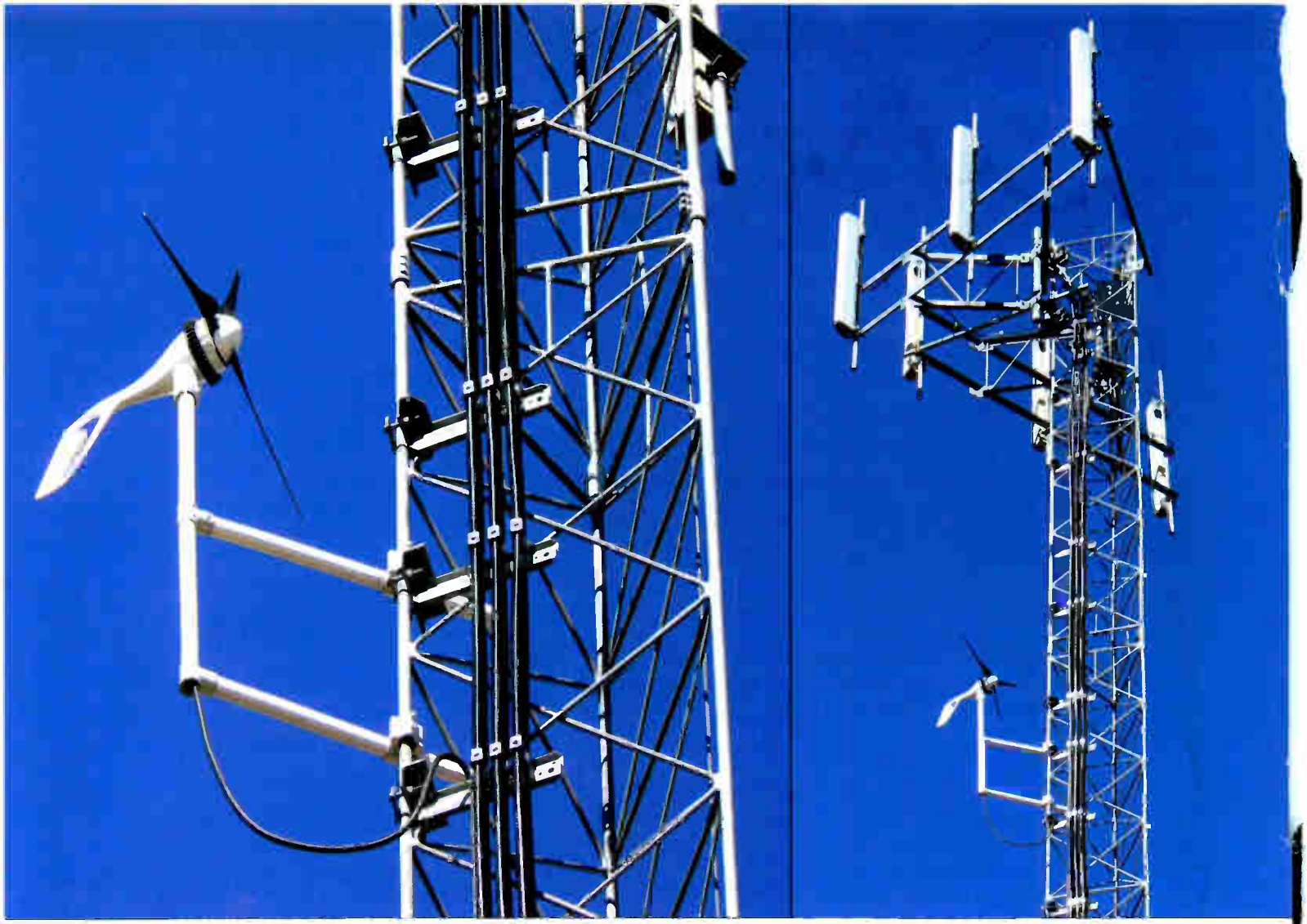
Carriers and tower owners could be slow to adopt the Tower Tube because larger builds aren't as prevalent as they once were, and the structure is enough of a change that the market will take some time to educate itself. But such a bold design helps to illustrate the key principles being pursued for site energy efficiency, such as reducing reliance on air conditioning and reducing cable feed loss.

Alternative energy

The two most prevalent alternative energy sources for homes and businesses in the United States are solar and wind power. Although there are between 200 and 400 solar cell site installations worldwide, these are typically



Most cell sites typically require anywhere from 2 to 10 kilowatts of electricity. Fuel cells that deliver the upper range of that capacity normally require two fuel cell cabinets in addition to storage for hydrogen fuel. This installation at Mica Peak in Spokane County, Wash., includes dual fuel cell cabinets (left) and two fuel cabinets to their right. Photo: ReliOn.



Above: An Air Industrial wind turbine side-mounted on a wireless telecommunications tower near Beech Mountain, N.C., delivers as much as 400 watts with a 30 m.p.h. wind. Such turbines often are connected to batteries to store power and may be combined with solar panels because periods of greater sunlight often have little wind and vice versa. Photos: Southwest Windpower.

To the left: Soboto women in tribal dress and jewelry gather beneath a wireless telecommunications site in Liasamis, Kenya, powered in part by a 7.5-kilowatt small wind generator atop the tower at the left. A diesel generator also supplies power for the Safaricom cell site. Photo: Bergey Windpower.

lower-powered sites in areas with little to no access to grid power and plenty of sunlight. Cost and space requirements make solar a difficult choice in the United States. Even though the price of solar power has fallen during the past 20 years, it can be as much as double or triple the price of conventional electricity. And the real deal-killer in the United States is space. U.S. base stations use a lot of power, so as much as 5,000 square feet of solar panels may be necessary to power a single unit. For sites with multiple carriers, the size becomes even more prohibitive.

Wind power is cheaper, but has several constraints that make it difficult to use for tower installations. Even "small wind" turbines are as much as 18 to 24 feet tall and require sufficient surrounding space to operate. Evaluating wind sufficiency is complex, as you need to consider average wind speed, frequency of high winds and topology. Last, but not least, wind project developers need buy-in from

Although solar power carries a pricetag and comes with a footprint that often puts it outside the cost limits of U.S. cell sites, sites in remote locations with no electrical grid service and no fuel availability sometimes use it. Cambodian mobile operator Star-Cell uses solar power at the site pictured above, along with an energy-optimized main-remote base station that consumes up to 50 percent less energy than standard base stations. Photos: Ericsson.

local zoning and planning agencies. Wind turbines are in the early stages of their deployment and may not be adequately covered in local regulations, leaving it open to interpretation and heavy involvement from local residents, a familiar and painful scenario for tower owners.

A more suitable alternative is fuel cells. While still pricey — current costs can range from $3,000 to $5,000 per kilowatt, well above diesel generator costs — U.S. carriers are starting to test fuel cells, both as temporary power and as backup sources, which is the more popular application. If the FCC order regarding cell site backup power stands and goes into effect, it would spur more rapid deployment at cell sites, increasing the financial burden for carriers and possibly for owners. The FCC wants carriers to have at least eight hours of backup power at cell sites, with a few exceptions noted in the order. Carriers are both pushing back and studying alternatives that include batteries, generators and fuel cells.

While the order does not mandate fuel cells, their use is being given due consideration as fuel cell costs come down and these systems are viewed as better, more efficient solutions than more conventional systems such as diesel generators that require costly fossil fuel and considerable maintenance. Because fuel cells have low emissions, they have been embraced as a "green" solution. In fact, some areas are offering attractive rebates that can reduce the upfront costs as much as 50 percent.

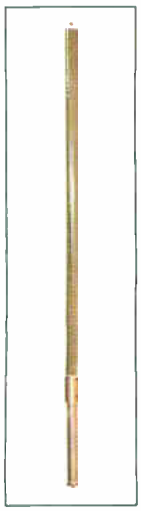
Fuel cells will require additional space, which could mean more rent to tower owners, but it also means their use could prove difficult in the smaller compounds. Most models for use at cell sites supply about 10 kilowatts of electricity. Such models require two cabinets, one the size of a standard base station cabinet to hold the fuel cell, the other slightly smaller to hold the fuel.

The fuel is a matter of some debate because hydrogen is highly flammable. Vendors have noted that the precautions embedded in fuel cell design greatly limit the possibility of an accident. Regardless, major tower owners have been following fuel cell deployment closely and are heavily involved in qualification of vendors before deployment can take place at their locations. State and local jurisdictions, particularly fire marshals, are adapting their codes to account for the permitting of such installations.

While carriers are feeling some pressure from potential regulatory changes and increased focus on environmental issues, energy issues at cell sites are primarily being addressed based on economic and practical considerations. The focus carriers and vendors have placed on equipment efficiency has already made progress and will continue to provide gains. But as these gains level out and alternative energy sources become more widespread, tower owners are likely to see more requests from carriers for different types of gear such as fuel cells or perhaps another application that is as yet unknown. Carriers and tower owners will proceed cautiously, but together they can ensure power use at cell sites becomes greener through more efficient equipment and deployment of appropriate alternative sources. agl

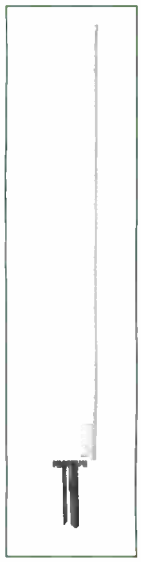
Carriers and tower owners will proceed cautiously, but together they can ensure power use at cell sites becomes greener through more efficient equipment and deployment of appropriate alternative sources

Edmund Wilson is a partner with Green Horizon, which provides energy management solutions to real estate firms. Prior to that, he spent more than 10 years in fixed wireless telecom firms in a variety of management roles. He can be reached at *ewilson@greenhorizonllc.com*.



Omni Antenna

The DS7A06F36U-N from **dbSpectra** is a 6 dB gain broadband 746–869 MHz Omni antenna for the deployment of 700 MHz outdoor networks. The antenna consists of soldered brass and copper elements for low intermodulation and is inserted into a 3-inch fiberglass radome for strength. The DS7A06F36U-N antenna is rated at 500 watts of power and has a direct ground path for lightning protection.
www.dbspectra.com



WiMAX Antenna

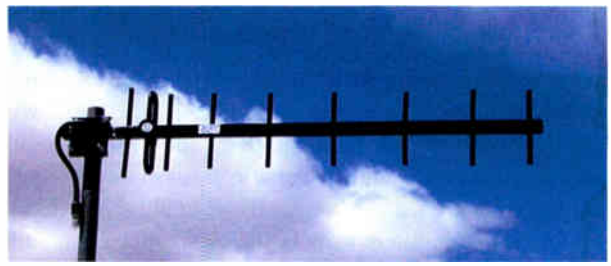
The Andrew WiMAX 2.5 GHz (2.3–2.7 GHz) Antenna from **Commscope** features Teletilt variable electrical downtilt design, which allows the antenna's electrical downtilt to be changed at any time to optimize network coverage and minimize site-to-site interference within the network. Because the antenna can be adjusted remotely, technicians need not physically access base stations to adjust antennas for user traffic patterns.
www.commscope.com/andrew/eng/index.html

WiMAX base station

Telex Communications' family of WiMAX base station antennas covers the 2.5–2.7 GHz and 3.3–3.6 GHz frequency bands. The antennas meet the CS RPE requirements of ETSI EN 301 525 v1.1.1 and offer pattern null-fill and F/B greater than 25 dB. These models come in 60-degree, 90-degree and 120-degree models. A type N coax connector is standard. They are vertically polarized.
www.telex.com/wireless

Fully Welded Yagis for SCADA/Data Applications

The **Larsen** YA5900W yagi is a directional antenna for SCADA/data applications. It is designed with strengthened aluminum alloys to assure long life and best performance for the most demanding applications. The YA5900W covers 890–960 MHz with a gain of 11 dBi. It has seven fully welded elements with a power rating of 300 watts and a wind load of 100 mph. **www.larsen-antennas.com**



Heavy-duty Welded Yagi Antennas

The 4EE premium line of welded yagi antennas from **DMS Wireless** features rugged construction for use in secure long-term installations. The antennas cover 216 MHz, 390 MHz, 450 MHz, 470 MHz, 700 MHz, 800 MHz and 900 MHz bands. Other features include stainless-steel construction, a solid-iron mounting bracket and a 360-degree weld to the boom.
www.dmswireless.com

PIM-rated Antennas

Passive Intermodulation (PIM)-rated base station antennas, available from **Bird Technologies Group** in partnership with Australia-based RFI, minimize signal degradation and interference for LMR applications. Traditionally, PIM only affected high-end users but the growth of digital systems and shared antennas makes PIM a problem for all users. The PIM-rated antennas feature high performance, broad bandwidth, high gain, and high power ratings, as well as flexible configuration and space-saving mounting options.
www.txrx.com

Compact Collinear antenna

The **Telewave** ANT790F2 compact collinear antenna covers the 763–869 MHz band for use by public safety, government and trunking base stations. The ANT790F2 is 3 feet tall and weighs 8 pounds, with no external ground plane required. A fiberglass-reinforced composite radome with one-quarter-inch walls protects internal components, and a brass base tube ensures solid mounting and a 200 mph wind rating.
www.telewave.com

HVAC In-building DAS

The **ExteNet Systems** HVAC in-building DAS reduces installation times and implementation costs, providing flexibility. The minimally invasive in-building service is based upon design that takes advantage of existing HVAC ducts to efficiently and cost-effectively distribute RF signals throughout a building. The network comprises fiber-optic cable that serves as the backbone for the network, which can provide support for multiple wireless service providers and technologies.
www.extenetsystems.com

DAS Consulting and Design

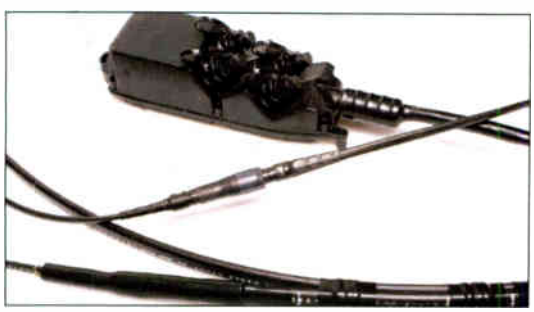
NextG Networks' DAS consulting and design services include site planning and permitting, site construction and project management services. NextG provides RF transport and backhaul services to wireless service providers over discrete, multi-frequency, scalable networks that improve wireless service quality, coverage and capacity.
www.nextgnetworks.net

Indoor and Outdoor DAS

The Andrew ION-M Series from **Commscope** is a robust, high-power-density fiber-based distributed antenna system with radio-over-fiber technology that operates in both indoor and outdoor environments. Typical applications range from coverage of the central business districts to underground, rail, tunnel and high rise coverage.
www.commscope.com

Utility-pole-mounted Dual-band Antennas

Utility-pole-mounted dual-band antennas from **Katherein Scala Division** offer a solution for urban and suburban wireless networks where simplicity of design and low visibility are needed. These cross-polarized devices are available in both sectorized (65-degree) and omnidirectional versions and cover all the existing wireless bands: cellular, PCS and AWS.
www.kathrein-scala.com



DAS Cable Systems

Corning Cable Systems' Evolant Solutions enables service providers to effectively expand and upgrade wireless networks. The virtually unlimited capacity and reach of optical fiber enable the mobility of wireless communications to deliver anytime, anywhere high-speed access through the deployment of DAS.
www.corning.com

In-Building DAS

The Digivance in-building coverage solution from **ADC** extends wireless coverage to specific areas within a building, multiple buildings or throughout a campus environment. This DAS solution distributes wireless coverage digitally for superior signal quality even over long-distance fiber runs. The configure-to-order plug-in transceiver design lowers initial installation costs and allows a scalable approach to indoor coverage.
www.adc.com

Line of DAS Antennas

Phazar Antenna's line of distributed antenna systems antennas includes an omnidirectional antenna that covers the 1710–2155 MHz band. The antennas can be used for either the AWS or PCS spectrum and will be available in combinations of dual and quad antenna configurations to accommodate various carriers. The antennas feature 7, 9 and 10 dBi gain with a VSWR performance of less than 1.7:1. The omnidirectional antennas can be mounted on utility poles, traffic lights, streetlights or lampposts.
www.phazar.com

professional directory

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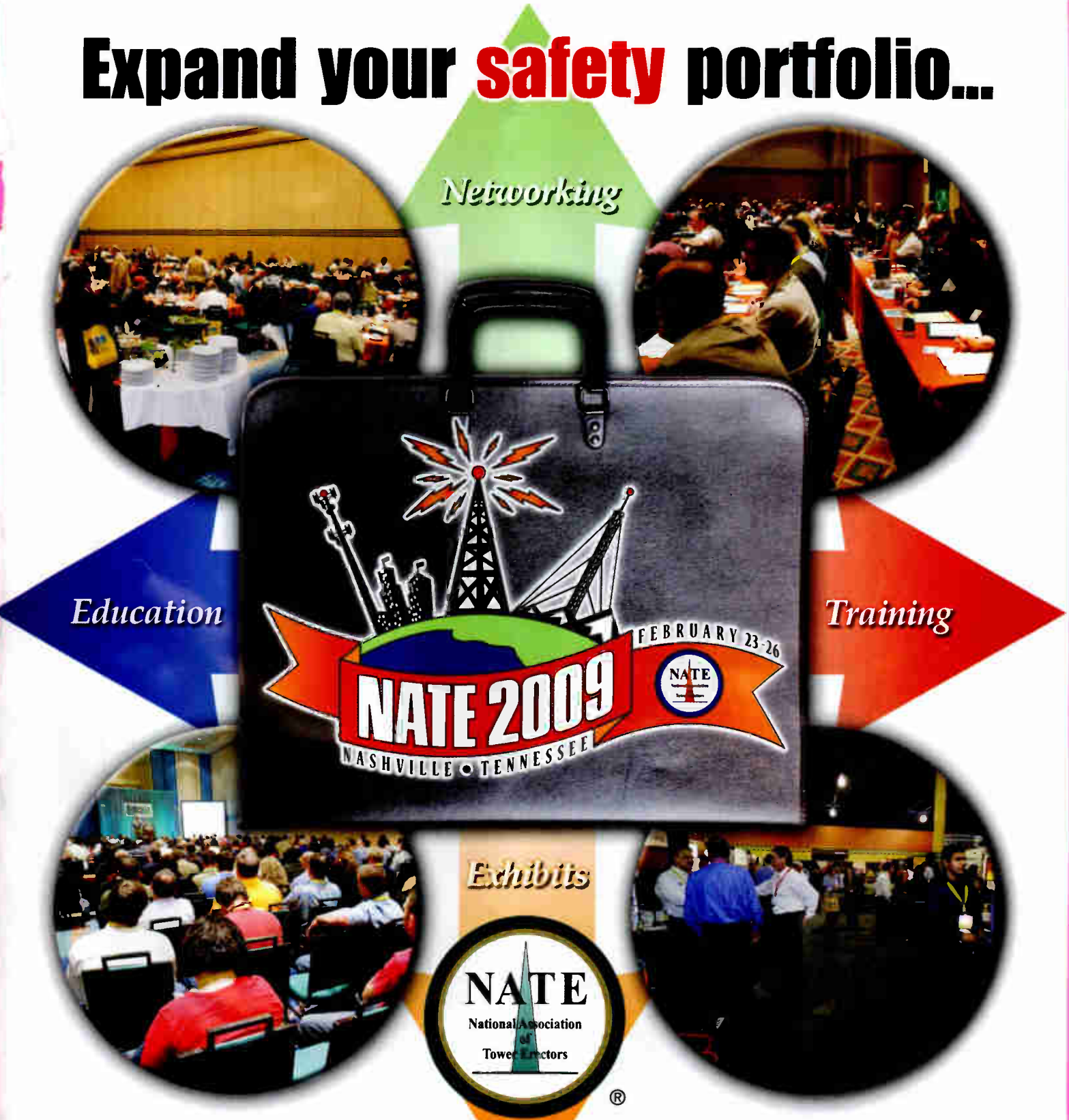

It's up to you.

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