Electric Energy T&D MAGAZINE
NOVEMBER-DECEMBER 2013 Issue 6 • Volume 17

Outage/Vegetation Management & Storm Restoration

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Electric Energy T&D MAGAZINE

Outage/Vegetation Management & Storm Restoration

Publisher:
Steven Desrochers:
steven@electricenergyonline.com

Editor in Chief:
Terry Wildman:
terry@electricenergyonline.com

Account Executives:
Eva Nemeth: eva@electricenergyonline.com
John Baker: john@electricenergyonline.com

Art Designers:
Anick Langlois: alanglois@jaguar-media.com

Internet Programmers:
Johanne Labonte: jlabonte@jaguar-media.com
Sebastien Knap: sknap@jaguar-media.com
Tarah McCormick: tarah@jaguar-media.com

Electric Energy Magazine is published 6 times a year by: Jaguar Media Inc.
1160 Levis, Suite 100,
Terrebonne, QC Canada J6W 5S6
Tel.: 888.332.3749 • Fax: 888.243.4562
E-mail: jaguar@jaguar-media.com
Web: www.electricenergyonline.com

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Post Publication mail agreement #40010982
Account #1899244

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Vegetation Management Strategy, Prudent Practices, & Tools

By James W. Dow

Prudent vegetation management, as applied to electric power transmission, embodies prudent risk management. Specifically, the prudent vegetation manager answers the following two questions in the affirmative – "YES."

1. Does the vegetation management program provide the minimum allowable clearance between the transmission line and the vegetation on the right-of-way?
2. Does the vegetation on the right-of-way allow workers a clear pathway to patrol, upgrade, and/or repair transmission system components?

In the questions above, the term 'right-of-way' means "*the corridor of land under* (and adjacent to) *a transmission line needed to operate the line* (reliably)" – NERC Standard FAC 003-2 definition – reference for italicized text/quote throughout. If indeed the answer turns out to be "NO," then it will not take very long (sense of urgency) before the transmission line becomes unreliable (consequence).

Observation: In the recent past, much has been written about what happens when either one or both of the answers to the questions is "NO." In such a circumstance, the transmission line owner may have operated under a:

1. 'Risk Avoidance' strategy – not performing an activity that could carry risk
2. 'Risk Sharing/Transfer' strategy – sharing/transferring the burden of loss with another party (the customer or the contractor)
3. 'Risk Retention' strategy – accepting the loss

Each of these risk/vegetation management strategies has been found by experience to be totally unacceptable – all mistaken beliefs that the owner can avoid, share/transfer, or accept such a significant loss unilaterally.

Conclusion: Over time, the standards and guidelines for improving and/or maintaining transmission reliability have evolved. The risk/vegetation management strategy of choice evolved also, evolving from a) 'Risk/Hazard Prevention' (e.g., the total elimination of risks/hazards takes too long, is too costly, or is otherwise impractical as it only leads to mitigation of unfound hazards) to b) 'Risk Reduction' (e.g., reducing the consequence [severity of loss] and/or the sense of urgency [likelihood of the loss occurring]). Ample evidence to support this conclusion can be found in the recent referenced literature:

1. FERC Frequently Asked Questions (FAQS) http://www.ferc.gov/help/faqs/tree-veget.asp
2. FERC: Tree Trimming & Vegetation Management http://www.ferc.gov/industries/electric/indus-act/reliability/vegetation-mgt.asp
3. Steptoe & Johnson PLLC: Power Line Rights of Way – FERC Approves New Vegetation Management Rules http://www.lexisnexis.com/legalnewsroom/environmental/b/oil-gas-energy-law/archive/2013/03/29/steptoe-amp-johnson-pllc-power-line-rights-of-way-ferc-approves-new-vegetation-management-rules.aspx

Accepting a strategy of 'Risk Reduction', vegetation managers turned their attention to implementation (e.g., take proactive steps of risk management). The proactive steps of risk/vegetation management may include the following – not necessarily accomplished in this explicit order:

1. Inspection
   a. Detect, identify, and locate the hazardous vegetation
   b. Assess the hazards to determine the level of risk
2. Plan the work (establish controls and make risk decisions)
3. Manage the work (implement controls through supervision and measurement)
4. Audit the work (evaluate)
5. Report (cost and regulatory reporting)

As pointed out by Steptoe & Johnson PLLC [3], the latest FERC vegetation management standard "*does not apply to circumstances that are beyond the control of a Transmission Owner subject to this reliability standard.*" For example, out-of-the-ordinary weather events often create circumstances that render ineffective even the most well-intentioned, proactive efforts to reduce risks. Notwithstanding,

1. If the transmission owner's goal is to reduce the likelihood of occurrence and/or the consequence of a risk actually occurring, then by FERC standard the owner is to invoke "*prudent vegetation management practices* (which) *dictate that substantially greater distances* (than the applicable minimum vegetation clearance distance) *will be achieved at the time of vegetation maintenance.*"

2. If this goal is to be achieved, then vegetation located both inside and outside the designated right-of-way boundary must be considered – within an effective corridor width (*e.g., the width of the corridor is established by engineering or construction standards as documented in either construction documents, pre-2007 vegetation maintenance records, or by the blowout standards in effect when the line was built*), which "*in no case exceeds the Transmission Owner's legal rights.*" Thus, the effective corridor width, for vegetation management purposes, may yet to be established – at least in some cases.

One real example of prudent practice when faced by circumstances beyond the control of a transmission owner, an ice storm, validates both the current revised version of the FERC standard as well as new tools aimed at servicing those standards. The ice storm occurred along the corridor of El Paso Electric's Arizona Interconnection 345kV Tie Line during the winter of 2010 to 2011. The affected section of the 'Springerville line' runs from the vicinity of Winston, NM/Montecillo, NM northwest toward the vicinity of Springerville, AZ. The terrain is rough as the corridor moves from a relatively flat desert type environment (moderate to sparse shorter, brush vegetation) up to higher desert plateaus (moderate to dense, tall Ponderosa Pine) of NW New Mexico.

Detecting vegetation violations from a central location in a span[1]

El Paso Electric had engineered the line to take into account at least 1½ inches of ice on the conductor. During the ice storm, the line experienced between 2 and 3 inches of ice. Such ice loading conditions forced contact between the energized line and vegetation in multiple areas even though prudent vegetation management practices had been in place for years prior to the event.

Since the Springerville line ran through Bureau of Land Management (BLM) land, multiple stakeholders were interested in seeing that deliberate action was taken immediately to resolve the problem and prevent it from occurring again in the future. El Paso Electric needed to gain the confidence of the various stakeholders and keep it. El Paso Electric elected to:

a. Capture airborne LIDAR along the affected length of the Springerville line
b. Construct a PLS-CAD model of the line
c. Determine (identify and locate) the inventory of vegetation clearance violations caused by the ice storm and deal with (resolve) each violation in a way that was measurable repeatable, and verifiable

To facilitate the analysis work, Darwin Jensen (El Paso Electric's transmission engineer) chose a corridor wider than the legal right-of-way boundaries to account for tall trees falling from outside the right-of-way. He analyzed the conductor operating conditions considering both the existing ice loading conditions as well as the established maximum sag conditions. The vegetation clearance criteria specified was substantially greater than the minimum allowable clearance distance.

To facilitate the clearing work, Ryan Paulk (El Paso Electric's transmission forester) made effective use of Aerotec's TopGun Veg-Tool. The instrument was loaded with:

1. The vegetation violations inventory to serve as a personal navigator
2. The clearance criteria
3. The specific conductor loading conditions to facilitate on-the-spot analysis of specific vegetation points of interest (e.g., trees)

As it turns out, El Paso Electric effectively addressed/satisfied most, if not all, of the requirements specified in the current version of the FERC standard a couple of years before the standard came into being. Indeed, care was taken to assure that the available airborne LIDAR data covered sufficient corridor width required to detect, identify, and locate vegetation that would violate the "*substantially greater* (violation) *clearance distances"* employed by El Paso Electric.

The results were completely satisfactory to all involved, to the extent that a previous article was published (Electric Energy/Summer 2011) describing actual experiences with the process, technology, and tools used. The article is entitled *LIDAR Technology and Handheld Vegetation Management Device Aid Transmission Group at El Paso Electric*. El Paso Electric's approach serves as a good example of the application of a Risk Reduction strategy. The technology, tools, and standards have certainly evolved to better serve El Paso Electric and others as time has passed since the ice storm; and other utilities are seriously contemplating the use of this new technology for their work.

[1] The photographs contained in this article were taken in the field while the actual work for El Paso Electric was being performed.

Opportunity: During the past couple of years, NERC prompted a transmission line re-rating study that was generally focused on transmission lines of higher voltage (e.g., 200kV and higher) and the revised FERC standard applies both to these 'NERC' re-rated lines and *explicitly to any lower voltage overhead transmission line that is either an element of an Interconnection Reliability Operating Limit (IROL) or an element of a Major WECC Transfer Path*. For any additional IROL/WECC lines, new PLS-CADD models may need to be constructed to facilitate the detection, identification, and location of hazard vegetation. This does NOT necessarily mean that additional airborne LIDAR data needs to be collected and PLS-CADD models can be constructed from Plan/Profile drawings. This is an important point to take note of.

As El Paso Electric discovered, Aerotec's methods/tools promote recurring use of right-of-way geometry data (via the TopGun Veg-Tool data model) to facilitate the forester's own inspection of right-of-way vegetation from the ground with or without airborne LIDAR data. The forester's use/adoption of the device even solves the problem posed by 'missing' airborne LIDAR data beyond the edge of the right-of-way width designated for LIDAR data capture for NERC's line re-rating studies.

As a further benefit to El Paso Electric, while the FERC order requires that *a transmission owner is now required to annually inspect all transmission lines subject to the standard*; there is no need to refly transmission lines to capture new airborne LIDAR data annually just to satisfy the revised standard. Using the Veg-Tool, El Paso Electric's forester can simply (and accurately) perform an on-the-ground inspection to update earlier inspection results and thus satisfy this requirement year after year.

Prudent practice is also on the minds of Alabama Power Company (APCo). The utility is now preparing to use the TopGun Veg-Tool to define the 'in-service' right-of-way for green-field transmission projects. The current effort involves the construction of a new 60-mile transmission line alongside an existing transmission line/right-of-way. James Weninegar, APCo transmission engineering manager, intends that hazard trees, along and beyond the planned/legal right-of-way boundary, will be identified, analyzed, and located using the technology to negotiate cutting rights with the land owners. Further, it is his intent that:

1. The identified hazard trees will be 'marked,' early in the line design process, using the GIS recording capabilities of the Veg-Tool for future use in clearing operations.
2. The Veg-Tool data model will constitute an 'in-service' definition of the transmission corridor for future vegetation management work (e.g., inspection and/or audit).

Mr. Weninegar fully recognizes the data model as a semi-permanent asset that can be used again and again, well into the future, to support subsequent inspection operations without the need for additional airborne LIDAR data capture. As he stated, "Unless we redefine the right-of-way, alter the conductor geometry, change our clearance criteria, or alter our conductor operating conditions, we can just keep on using the TopGun Veg-Tool for our inspections."

Additionally, Mr. Weninegar intends to construct an 'in-service' version of the transmission corridor (e.g., TopGun Veg-Tool data model) for each line of a larger portion of APCo's higher voltage transmission system and use the tool for future vegetation management inspections and audits as APCo implements the revised FERC standard. Mr. Weninegar is relying on his vast experience in the engineering, maintenance, vegetation management, and operation of electric power transmission lines supported by his prior use of airborne LIDAR and other types of remote sensing to envision success in the construction and use of his 'in-service' transmission corridor models.

Overall, Aerotec's TopGun Veg-Tool is an easy-to-use,[2] lightweight, versatile, single-operator, flexible handheld device that, from a single spot within a given span of an electric power transmission line, can be used to take 'single shot' measurements of multiple suspect trees, both inside and outside span boundaries, to:

1. Provide accurate and easy-to-read (PASS/FAIL) vegetation clearance information. While performing the field inspection task, the forester uses the device to:
   a. Designate (shoot) and identify (analyze) suspect vegetation as a violation of specific (one or more) clearance criteria based on risk levels (urgency), and multiple conductor operating conditions. Default to multiple geographic boundaries, and multiple clearance violation types.
   b. Locate the specific vegetation violation(s) for purposes of marking/flagging offending trees, auditing the site, reporting work progress, and re-inspection going forward.
   c. Communicate violation(s) type, characteristics, and location using a camera, cellular phone, and SD storage card.
2. Collect other specific information about vegetation violating clearance criteria, such as stem diameter at breast height, species, growth observations year-to-year, and so on.
3. Package the analysis results and associated observations/measurements (shape file) for geographical information system (GIS) database population/update, as may be required.

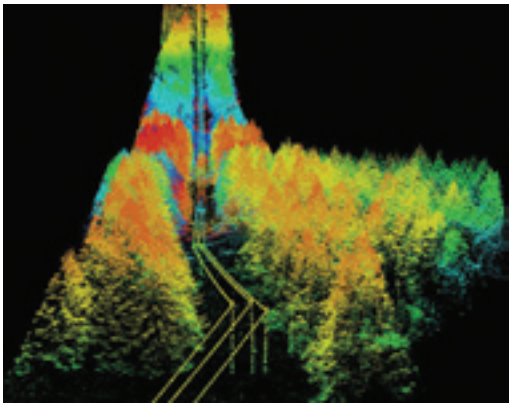
[2] Initial training for a utility forester to effectively use the TopGun Veg-Tool takes about two hours, even in very rugged terrain, involving instrument calibration, start-up, field use (measurements and analysis), data download, data model handling, and archiving results.

The device integrates several unique technologies into a lightweight surveyor's staff configuration for ease of use in the field work environment. Included are a handheld laser rangefinder, compass and inclinometer as well as a handheld computer with Bluetooth, GPS positioning capability, digital camera, and cellular phone. The software comprises a GIS and Aerotec's own vegetation management software and right-of-way model.

The tool is useful to every type of electric utility and can be applied to transmission and distribution rights-of-way (the right-of-way geometry model can be derived from existing Plan & Profile Drawings, PLS-CADD Models, and/or LIDAR data). This can reduce the need to have the right-of-way flown for acquiring LIDAR in order to produce the geometry data model and the existence of a PLS_CADD model expedites the process of constructing the data model (right-of-way geometry) while accounting for multiple conductor operating conditions. In addition, Plan/Profile drawings may be used to create the data model. It is NOT necessary to have an existing inventory of clearance violations previously derived from LIDAR data in order to make effective use of the technology. Because customer-specific vegetation clearance criteria for various conductor operating conditions are required, Aerotec's vegetation assessment capabilities can support customers' efforts to refine vegetation clearance criteria in order to achieve specific objectives pertinent to their vegetation management program.

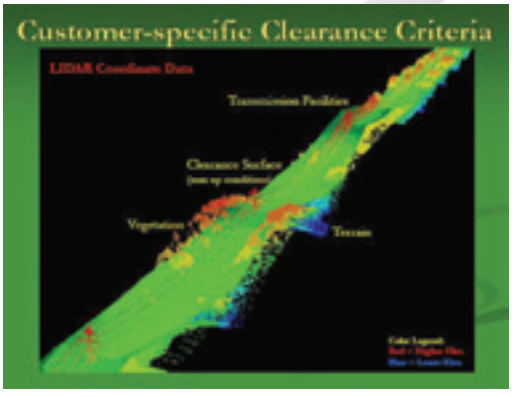
The most efficient, cost-effective and accurate approach for taking advantage of the tool is to have:

1. Existing LIDAR data/PLS-CADD model(s) for the right-of-way



Airborne LIDAR data of an existing right-of-way

2. Aerotec produced the right-of-way geometry model, an inventory of vegetation violations, and a TopGun Veg-Tool data model (complete with a clearance surface map accommodating multiple conductor operating conditions) along the entire right-of-way



Three dimensional model of a customer's clearance criteria.

Cataloging vegetation clearance violations in rough terrain

The tool adds considerable capabilities to a utility. Right 'out-of-the-box' it increases the productivity, effectiveness, and efficiency of the utility forester.

The TopGun Veg-Tool is light weight and rugged.

MAXIMIZE A SHRINKING BUDGET

Industry experts share tips to achieve program goals in challenging times.

Protecting public safety and maintaining uninterrupted power flow remain top priorities for land managers, despite a steady trend in budget reductions. Combined with rising labor, fuel and equipment costs, the challenge is on for managers to find more efficient weed- and brush-control strategies.

Jack Doolittle, co-owner of Mid Dakota Vegetation Management and John Boyd, extension weed science professor with the University of Arkansas, share advice on achieving program goals with increasingly limited resources.

Lasting solutions

While mechanical brush control may deliver instant results, incorporating herbicide applications into a vegetation management program can pay dividends with effective, long-term control. Boyd, who has been working with DuPont™ Streamline® and Viewpoint® herbicides for four years, says the true test is how a site looks one year after treatment.

"Using these herbicides, we're seeing 90 percent or better control after one year. That's excellent, especially on sites where we've treated brush that's a mixture of ages and sizes."

These long-lasting results can double or even triple the interval between control measures. "With hand cutting, you could find yourself back at square one within a year. With effective herbicide applications, we're seeing two to three years between treatments," reports Boyd. "That frees up resources to complete other vital maintenance projects."

Do it right the first time

Mid Dakota Vegetation Management oversees noxious weed control for multiple government agencies and public and private utility companies in South Dakota and Minnesota.

Doolittle and his partner Andrew Canham have seen considerable reduction in weed escapes and longer-lasting results since switching to DuPont™ Perspective® herbicide for invasive weed control.

"After two years using Perspective®, we're seeing 85 to 95 percent control of leafy spurge, compared to the 65 percent control we expected with our previous herbicide program. And this year we've had zero returns for weed escapes," Doolittle reports. "That performance helps us accomplish more with each budget, and it takes the worry out of our work."

Fine-tuning operations

Perspective®, Streamline® and Viewpoint® feature low use rates, which adds to their efficiency in aerial and remote applications.

"Unlike other products that call for gallons or pounds per acre, these herbicides from DuPont are measured in ounces per acre," says Boyd. "Crews working out of helicopters or in remote locations can carry a small amount and cover many acres."

Doolittle adds that low use rates also ease operations when working in the public eye. "The public is interested in your product choices. When you can explain that you're using just ounces per acre of environmentally responsible products, it alleviates concerns and helps a project run more smoothly."

Incorporate flexibility

Another productivity aid is flexibility. "Having a wider application window helps extend the season for us, which is a big advantage when we're under pressure to get everything done at once," says Doolittle. He adds that including a grass herbicide in the tank with Perspective® provides effective bareground control.

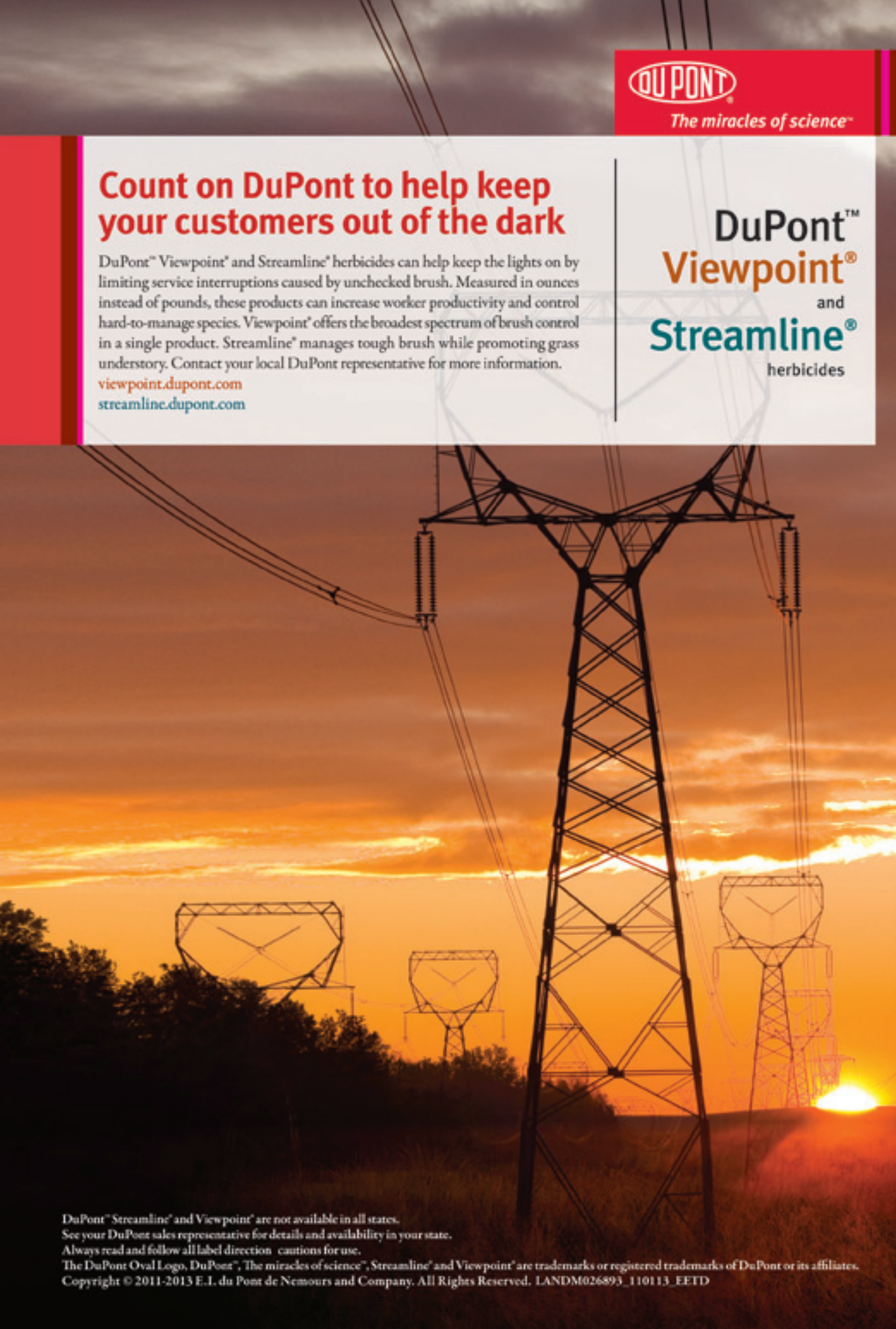
"Perspective® provides more options to achieve long-lasting results. And that increases efficiency in our selective weeding and bareground weed-control programs."

For more information on maximizing productivity in your vegetation management programs, visit **landmanagement.dupont.com**.

Productivity Boosters

Three effective herbicides from DuPont are helping land managers efficiently achieve vegetation management goals, freeing up resources to accomplish more.

- **Perspective® herbicide** offers selective weed control, maintaining desirable grasses while tackling broadleaf and invasive weeds, including ALS- and glyphosate-resistant weeds.
- **Streamline® herbicide** controls noxious weeds, brush and broadleaf weeds in industrial rights of way where maintaining natural grasses is desired.
- **Viewpoint® herbicide** provides broad-spectrum brush control in utility and industrial rights of way.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Gathering the amount of data required to accurately identify, locate, analyze, and report vegetation clearance violations remotely (at any time of the year) is possible due to the ability to:

1. Capture (single-shot) measurements to vegetation features without the need for a reflector (e.g., a person holding a prism pole)
2. Enable the forester to carry the entire geometry of the right-of-way (along with the entire LIDAR-derived inventory of vegetation violations), the geometry of the structures/conductors, the critical conductor operating conditions, and appropriate clearance criteria to the field – to process/analyze single-shot measurements (TruPulse 360) using the TopCon GRS-1 handheld computer. It is not necessary for the forester to 'shoot' either the base of the target tree (which may or may not be visible) or the transmission line conductor

The TopGun Veg-Tool:

1. Affords the electric utility a tool to address all aspects of FERC Standard FAC-003-2 Technical Reference compliance requirements
2. Data model is a semi-permanent asset that can be used year-after-year, well into the future and the data model only needs to be updated if:
   a. The clearance criteria is updated
   b. The geometry of the right-of-way changes
   c. The conductor operating conditions being analyzed are changed

A useful accessory for the forester in the field is the TopGun Tablet. The personal navigation, inspection, auditing, and reporting tool offers a larger screen. The user can accomplish the same inspection/audit tasks. The GPS-enabled tablet does not necessarily employ the laser range finder; but it makes use of the data model's clearance surfaces to present a contour map(s) of the clearance surface(s) to highlight the allowable vegetation height-above-ground enabling the forester to identify, locate, and report a clearance violation.

After the forester has identified, analyzed, and located (or 'marked') the vegetation violations (whether or not aided by the use of an airborne LIDAR violation inventory), the actual clearing work can be planned and tasked out, e.g., work management. To support work management, Aerotec offers other effective tools operating in a GIS environment.

It is simply not enough to visualize the inventory of violations (whether originating from LIDAR or otherwise) using some form of visualization aid – whether it might be Google Maps, Google Earth, or some other display technique. Users really do have to pay for those licenses and endure the significant analytical limitations of the software. Real work management is required; and this does not mean just 'scheduling.' Work management involves:

- Categorizing the work according to type of work
- Assessing the difficulty of traversing the terrain
- Assigning crews equipped with special tools
- Getting the crews to the work site
- Assessing the potential impact of weather
- Tracking vehicles/crews as may be required
- Reporting real-time events/issues
- Tracking work status, and more

Foresters don't just marvel (look) at their data, they facilitate the accomplishment of real work and ensure that the quality/quantity of the work is adequate to meet standards – in more than a 'just good enough' manner. Foresters need real, functional tools to accomplish their work.

All-in-all, the utility forester is committed to focusing on the results required to facilitate prudent vegetation management – period! It's important to know where to look for hazards; but it is equally important to know where you don't have to look for hazards.

About the author

James W. Dow was an original founder of Aerotec, LLC (airborne remote sensing) in 1996, having retired from the Alabama Power Company as Manager of Information Resources Plans and Projects. Mr. Dow is generally acknowledged as one of the most influential engineers in the United States regarding CAD/CAM/CAE technology and LIDAR 'filtering' software development. Mr. Dow has over twenty-five years of experience in application software development and support for a variety of industries that include military defense, aerospace, forest products, construction, communications, and electric utility.

Mr. Dow's experience spans all aspects of information management methodology/technology from strategic planning for network-infrastructure through design, engineering, construction, implementation, and support of mission critical computer application systems across multi-company/multi-state political and geographic areas. He has a BS and MS, Aerospace Engineering and has graduated from Virginia Polytechnical Institute in Advanced Particle Dynamics.

In 1979, Mr. Dow co-authored an internationally acclaimed book entitled. "*The Guide for the Evaluation and Implementation of CAD/CAM Systems.*" He played a key role in bringing several successful European CAD/CAM software products to the U.S. marketplace.

On the Tenth Anniversary of the 2003 Blackout:

Are we Any Closer to Preventing Outages?

By Edward H. Kennedy

Ten years ago an overgrown tree near Cleveland, Ohio started a chain reaction that caused the blackout of 2003, a cascading power failure that caused most of the Northeastern United States and neighboring parts of Canada to lose power. The blackout left approximately 50 million people without power. It was a power failure that shut down 265 power plants, with 508 generating units, including 10 nuclear power stations, rapidly spreading across North America.

In its final report on the causes of the blackout of 2003, the U.S.- Canada Power System Outage Task Force identified poor vegetation management, computer failures, inadequate training and lack of real-time situational awareness of grid conditions as the main factors behind the disaster. The task force also identified institutional failures across the industry, particularly in setting and enforcing reliability standards, and coordinating across the grid.

This catastrophe provides an important example of how vulnerable our modern economy is to disruptions on the power grid but the 2003 Blackout is not alone. On the tenth anniversary of the Blackout, the Department of Energy (DOE) and the White House published their report 'Economic Benefits of Increasing Electric Grid Resilience to Weather Outages' where they found that seven of the costliest storms in U.S. history occurred after the Blackout. These 'billion dollar' storms have had a devastating effect on the economy and society. Outage profiles of these storms reveal a similar pattern: utilities attempt to restore power to the majority of customers relatively quickly, while a substantial number of customers remain without power long after the event occurred. What we've learned is that the longer it takes to restore power, the higher the cost to customers and the economy. In the case of Super Storm Sandy, losses have been estimated to be as high as $65B and 50 of the 72 people who died in this storm were directly attributed to power outages.

By their own definition in the DOE and White House report, 'A more resilient grid is one that is better able to sustain and recover from adverse events like severe weather – a more reliable grid is one with fewer and shorter power interruptions.' With restoration taking anywhere from 3 to 20 days during an average storm, what can be done to increase the reliability and resilience in our grid moving forward?

Investments in the Distribution Network Will Help Restore Power Faster and Build a More Resilient Grid

In North America, the distribution part of our electric grid is the largest part of a utility's network spanning over six million miles. According to the Edison Electric Institute (EEI), it's also where over 90 percent of the outages in the U.S. occur. Yet, it is largely unmonitored and historically has been underfunded. Utilities have little to no visibility or real-time situational awareness into this part of the grid.

The technology to improve situational awareness and reliability is available. A new breed of software-driven smart grid sensors built for the distribution network have the ability to improve situational awareness by communicating real-time grid health data back to utilities to help them locate and restore outages faster.

This technology goes much deeper than smart meters, which are located at the home and can only tell if a customer has power or not. Pinging smart meters after power has been restored has been shown to be a valuable way to confirm that the crew's work to restore outages has been successful; however meters alone cannot identify failure locations in the distribution part of the network. Smart grid sensors on the distribution network are often much closer to the point where the majority of outages occur and provide better outage location information back to utilities to focus their repair efforts.

The breakthrough in making this an affordable and viable option for utilities came recently. In large part it's been the ability to provide the sensors with flexible and reliable wireless communication paths (e.g. Wi-Fi, WiMAX, and cellular) to span the millions of miles of unmonitored distribution lines and provide utilities with the real-time situational awareness they need to combat outages (see Figure 1).

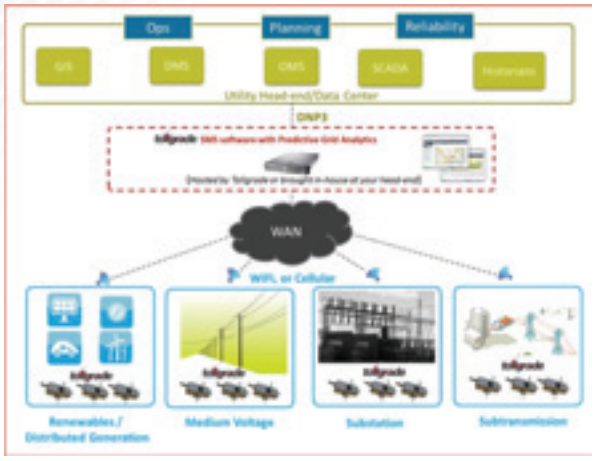

Figure 1: Next Gen Smart Grid Sensor Distribution Network

Smart Grid Sensors on the Distribution Network Can Prevent Non-Storm Related Outages

As the 2003 blackout taught us, not all significant outages are storm-related – they can be caused by vegetation overgrowth, or stress from too much load on the system. But, it's also our aging infrastructure that is causing a good portion of non-storm related outages. It's estimated that 25 percent of outages are caused by failing equipment. So what if the grid were smart enough to tell the utility of vegetation overgrowth or equipment failure before they caused outages?

This new breed of smart grid sensors has predictive capabilities that can capture vital 'fault signatures' from the grid to assess the health of the network and important assets like substation transformers or hydraulic reclosers. By creating a library or database of 'fault signatures,' utilities can be in a position to predict and correct problems before they occur.

This is becoming hugely important as the grid ages. Today, it is estimated that 70 percent of transformers are over 25 years old and quickly reaching their end of life. When these assets fail, outages occur. By having the vital knowledge of these failures before they happen, utilities could prevent more of these types of outages. While this may sound futuristic, this concept has worked in other industries like the computer security industry where having a library of signatures from known viruses and malware has helped prevent attacks. Only recently has this concept been applied to improve grid reliability.

The foundation of a predictive grid is being researched and embraced at a variety of the world's leading utilities such as Duke Energy and CenterPoint in the U.S., Toronto Hydro in Canada and Western Power Distribution in the United Kingdom. These utilities are deploying Tollgrade smart grid sensors with Predictive Grid℠ Analytics that are accurately detecting and classifying faults that cause outages in real-time. For example, in two very large deployments in North America, the signature to detect blown fuses on laterals is being used to report outages 20 to 30 minutes before a customer calls. All events are linked to map-view displays that make it easy for utilities to pinpoint the locations of problems for quick response and resolution.

Toronto Hydro, the largest municipal electricity distribution company in Canada, eliminated 550,000 customer outage minutes with sensors operating on two feeder lines alone. Think of the positive impact this could have if applied across the larger distribution network. Ivano Laboricca, Toronto Hydro's vice president of asset management said, "From an asset manager's perspective, this technology will allow us to know immediately if there is a problem that is easy to fix or if it is a serious problem that requires capital investment."

It is imperative that we begin to target the necessary distribution grid modernization upgrades that require future investments to ensure a safe and reliable supply of energy.

By having the situational awareness, the use of smart grid sensors with Predictive Grid Analytics will be much more effective than smart meters in finding the causes of outages on the distribution-side of the network. The net benefit to all will be the ability to restore power faster in storms. Finally, as this technology matures, utilities will have an arsenal of known 'event signatures' that will help them predict equipment failures or other non-storm related events that cause outages and stop their propagation before they turn into massive rolling blackouts.

About the author

As a driver of global telecommunication transformation, **Edward H. Kennedy** has been recognized for his ability to build innovative, high-growth companies. Probably best known as the CEO and President of Ocular Networks, a company he co-founded. As President and CEO of Tollgrade Communications, Ed is putting his experience transforming the telecommunications industry to work by helping utilities modernize their nation's power grid.

Ed has held several executive level positions at Tellabs, Ocular Networks, Rivulet Communications, Alcatel and Newbridge Networks and board positions at Hatteras Networks, Imagine Communications, Visual Networks (acquired by Danaher Corporation NYSE: DHR) and Extreme Networks (NASDAQ: EXTR). Working with Virginia's Governor Mark Warner and the Appalachian Regional Commission in 2003, Ed is a staunch advocate of the importance of telecommunications in Rural Development. Ed is a graduate of Virginia Polytechnic Institute with a Bachelors of Science degree in Electrical Engineering.

Customized IVM Programs Support Safe, Reliable Power Supply

By Dan Zapotok, industrial vegetation management portfolio manager, DuPont Crop Protection

One overgrown tree can interfere with electrical transmission and bring thousands of businesses and homes to a standstill. Effective vegetation management along utility rights of way is vitally important as utility companies face immense pressure to avoid outages and deliver safe, reliable energy.

The Federal Energy Regulatory Commission (FERC) has upped the ante on this issue by strictly enforcing transmission reliability standards. Utilities failing to meet stringent vegetation clearance guidelines for power lines face fines of up to US$1 million per day if vegetation-induced outages occur.

Many utilities are turning to trusted partners to help them create and implement integrated vegetation management (IVM) programs to keep vegetation under control and power flowing. There's no silver bullet and no easy answers. Terrain, land use, environmental conditions, neighboring entities and other factors help determine the right mix of vegetation control techniques in each situation.

Fortunately, North American Electric Reliability Corporation (NERC), the organization designated by FERC to develop transmission reliability standards, gives land managers flexibility to customize plans that meet each site's vegetation needs. Biological, chemical, mechanical, manual and cultural methods can all be part of the best IVM prescription.

Making it Local

Choosing the right weed control to match local conditions is an important component of any IVM plan. With thousands of miles of rights of way and hundreds of substations to service, weed control programs that help increase crew productivity are essential to meeting tight timeframes and working within budget constraints. The vegetation management industry continues to improve control options, with advanced products that offer more reliable brush and weed control at low use rates to increase crew productivity and reduce overall vegetation management costs.

Preparing and implementing an effective IVM plan calls for collaboration between utility companies, land management professionals, and landowners. Three custom application companies that partner with utility companies share how they help clear the way for safe, reliable power.

Systematic Approach Helps Identify Right IVM Plan

Joe Lentz, vice president of Arborchem Products, Mechanicsburg, PA., helps customers achieve their vegetation management goals with a systematic approach that maximizes the IVM program effectiveness and efficiency. Lentz has 29 years of experience in the vegetation management industry as an applicator, distributor and technical specialist.

"Whether I'm helping utility companies, invasive weed managers or departments of transportation, I use three main objectives when setting up an IVM program," says Lentz. "First, we need to achieve a high percentage of control for unwanted vegetation. Second, we must operate productively by matching the application technique to the size and density of vegetation to be controlled. And third, we need to stay on target by using the right herbicide and application technique for site conditions. By following these three steps, we narrow the field of herbicide combinations and application techniques that will accomplish the task, whether it's providing safe, reliable power, improving site lines on roadways or eradicating invasive weeds."

Long-Term Solution

When working with utility companies who rely completely on mowing to maintain rights of way (ROWs), Lentz points out the benefits of employing herbicide applications as a long-term solution with economic advantages. "Brush that is mowed every two to three years keeps coming back with bigger root systems, so every time you mow, it costs more. Over 15 years, you've mowed the ROW five times," Lentz explains. "If you follow the first mowing with a cut-stubble application, it will cost you a little more up front, but it's likely you'll never have to mow again. Every four or five years, a crew with backpack sprayers can treat regrowth at a lesser cost because you reduce stem density each time. Plus, you've cut out two applications over the 15 year period."

Hundreds of line and tree crews, needed after Superstorm Sandy, gathered at a Brentwood, NY staging area on Long Island.

When Large Storms Hit and Resources Are Needed

It has been a year since Superstorm Sandy knocked out power to more than eight million people in the densely populated northeastern U.S. and eastern Canada. Because Sandy was so huge – approximately 1,100 miles wide – dozens of utilities and municipal agencies had to scramble to bring in additional line repair and tree clearing crews, many of them from great distances.

With more than 50 years of storm response expertise, Utility Lines Construction Services, Inc. (ULCS) was one of the leading providers of line repair and reconstruction services after Sandy hit. More than 360 skilled line personnel, experienced supervision and specialized equipment were mobilized for emergency restoration work on the systems of seven utilities from Maryland and West Virginia to Connecticut. Many crews were pre-staged for a quicker response and some remained on storm duty for three weeks.

Skilled personnel with proper tools and GPS-based vehicle location systems, come standard with all ULCS crews.

Resources in People, Experience and Equipment

Since ULCS is an Asplundh company, there is a strong storm coordination team and response system in place, with plenty of resources to back them up in an emergency. In fact, Asplundh and its various subsidiaries had over 10,000 tree and line personnel working on the Sandy restoration effort last year. With one call or an e-mail, a utility can receive almost any number of personnel with excellent field and safety training, as well as supervision and logistics experience. They come equipped with well-maintained service trucks, aerial lifts, digger derricks and a variety of specialized heavy equipment and tools.

ULCS provides a unique blend of capabilities to help utilities restore power after a storm, safely and efficiently, including:

- **Storm Damage Assessment and Patrolling**
- **Overhead or Underground Repair and Reconstruction**
- **Logistical and Staging Support Services**
- **GPS-based Vehicle Location System for Efficient Dispatching**

ULCS crews come prepared to work in any type of weather.

To expedite the restoration process, ULCS can provide additional experienced personnel to assess damage and patrol or safeguard damaged infrastructure. Whether it's wind- or ice-damaged overhead lines or flood-damaged underground lines and substation equipment, ULCS has the expertise to help repair and rebuild them. When damage is extremely widespread, ULCS can assist utilities with logistical support such as temporary accommodations, food, and fuel for up to 1,500 people. And dispatching ULCS crews is much more efficient because vehicle location data is at the fingertips of storm response coordinators.

Leadership

All the people, experience and equipment in the world aren't effective without good leadership. ULCS's leadership has extensive background in the utility industry. We take a proactive stance when it comes to storm response. Pre-planning discussions are used to create a support plan for our customers. And as an Asplundh company, ULCS mandates all of its employees to take a leadership role by setting a good example when it comes to safety. For more information or to schedule an appointment, please call toll-free 1-877-884-5426 or e-mail ***stormutilicon@asplundh.com.***

RESToration ASSURED

From ice storms to hurricanes, Utility Lines Construction Services (ULCS) is always ready to send experienced storm crews to areas hard hit by natural disasters. ULCS, an Asplundh company, can deliver the skilled line personnel, the trucks and tools they need, and even the tent cities to house them.

- T&D damage assessment
- T&D repair and reconstruction
- Logistical support

Call our Power Restoration Team today to develop a customized storm plan or e-mail: stormutilicon@asplundh.com.

UTILITY Utility Lines Construction Services, Inc.

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Education Is Key

Describing the value of IVM programs for utilities is a top priority for Lentz. His team conducts more than 75 presentations a year, addressing local, regional and national utility personnel, applicators, pesticide and utility inspectors, industry association groups, and citizens.

"With high employee turnover rate and a lot of young people entering our industry, many people don't understand the value of IVM," notes Lentz. "Speaking to these groups really helps get the message out."

Joe Lentz recommends cut-stubble applications to help minimize mowing and brush control costs along rights of way

Solving Diverse Vegetation Control Challenges

The surrounding land where utility ROWs and substations are maintained by Mid Dakota Vegetation Management can vary from corn and soybean fields in Minnesota and South Dakota, to pastures and rangeland in Montana and Wyoming, to rocky, mountainous areas in the Black Hills. Whatever the challenge may be, Jack Doolittle and Andrew Canham, who own the Miller, SD, based company, work closely with their utility customers to provide the right herbicide program to fit within an overall IVM plan. "Proper herbicide application made in a timely manner can produce outstanding results in most situations," says Doolittle. "For more than nine years, we have been controlling weeds and brush for our utility customers with effective herbicide treatments. We've had good success by communicating our recommended programs and maintaining a good working relationship with our customers."

Individualized Programs

The company's utility customers include Western Area Power, Xcel Energy, and Black Hill Power. To meet the diverse needs of each utility, Doolittle and Canham work with their Crop Production Services (CPS) and DuPont Land Management representatives to determine the right herbicide combination to meet each site's needs.

In farming areas, where corn, soybeans and other crops are grown up to the base of utility structures and substations, applications must be made after crops are harvested, with extra care to keep applications on target. "That's a big factor when selecting herbicides," Doolittle says. "With the program we're using, which is a tank mix that incorporates DuPont™ Perspective® herbicide and Esplanade herbicide, we haven't had any problems with chemical relocation. It fits our program really well."

Low use rates are another reason Doolittle relies on the Perspective® and Esplanade program. "Being able to treat a large number of acres without having to pull a trailer or bring an extra truck just to carry herbicides makes it that much easier for our crews."

Low use rates help crews operate efficiently and maintain productivity

Safety Training

An important aspect of maintaining safe, reliable power supply is ensuring crew safety, notes Doolittle. His company holds training and safety meetings in the spring and summer, instructing applicators in application techniques and safe equipment operation. Whether making applications from a motorized terrain vehicle or backpacking by foot in the hills, safe herbicide application is a priority.

Program Prevents Fire, Keeps Sites Safe

With wild fires a common threat in the Hatch Grade mountain region near Touchet, WA, Kevin Brown and his crew at Kevin's Custom Spraying make fire prevention a key focus of their vegetation management program for a site that includes 500 wind turbines. Owned and operated by Florida Power & Light, the wind farm is located in a remote mountain site, which adds special challenges for vegetation management programs.

"Our top priority is keeping a 12- to 15-foot bare ground firebreak around the turbines and utility boxes," Brown says. "We have lots of fires in this area and they can move fast, which makes it extremely important to keep vegetation away from the equipment."

Protecting Crews

While wild fires can damage wind turbines, rattlesnakes pose a different threat for utility workers and applicators. "Keeping a clean setting around the turbines helps prevent workers from accidentally stepping on one of the area's many rattlesnakes. The bare ground area also helps crews find dropped tools more easily instead of having to search for them in a patch of Russian thistles."

Brown battles a number of difficult-to-control weeds that can fuel fires and hamper turbine maintenance. "In the fall, we applied a tank mix incorporating 10 ounces of DuPont™ Perspective® herbicide and 2 pounds of Spike herbicide," Brown says. "That combination has done a great job of controlling tough weeds like Russian thistle, marestail and yellow starthistle. Before we used Perspective® we weren't getting adequate marestail control."

Fewer Trips, More Productivity

Crew productivity is another concern for Brown. Products that are effective at low use rates help his applicators maximize each trip to the remote wind farm location.

"In the past when we used products that were applied at 10 or 12 pounds per acre instead of ounces per acre, like Perspective®, we needed large volumes of water for mixing," Brown explains. "Now when we're making applications with a four-wheeler, we can use less water. It's not easy getting to these sites, so the least amount of herbicide and water we have to carry on the truck, the better. By adding this latest product to our weed-control program, we've kept weeds under control with a fall application and eliminated costly, time-consuming return trips for retreatments the following summer."

Reliable bare ground control around wind turbines is a priority for controlling wildfires

Research-Based Program

As further proof about the benefits of IVM programs in ROWs, Lentz points to the 60-year State Game Lands 33 Research and Demonstration Area study, conducted on land near State College, PA. The cooperative study, conceived by Asplundh Tree Expert Co., was established by William Bramble and W. Richard Byrnes, both of whom later joined the faculty at Purdue University. Partners in the study included Pennsylvania Electric Company and Pennsylvania Game Commission.

"The study, which is unique to utility ROW vegetation management, shows the positive effect on wildlife habitat when herbicides are part of vegetation management plans," Lentz says.

The project, which has tracked sites from 1953 to the present, pointed out positive effects on a plant community when herbicides are part of the vegetation control mix. "With so many brush species, we generally need more than one herbicide for control. Newer chemistries with lower use rates offer much more application flexibility and are much more effective."

In bare ground applications at substations, Lentz has applied a tank mix including DuPont™ Perspective® or Viewpoint® herbicide with excellent results. According to Mr. Lentz, "These combinations have been Cadillac treatments for us. And with the low use rates, we've gone from applying pounds with previous products to just ounces per acre. Everyone who used them was extremely satisfied with the control they received."

About the author

Dan Zapotok is the industrial vegetation management portfolio manager for DuPont Crop Protection, where he is responsible for products within the IVM, railroad and forestry markets. Zapotok has worked with DuPont for more than 20 years, holding positions in operations, project management and marketing. He earned a bachelor's degree from Pennsylvania State University.

NOTES:

Always read and follow all label directions and precautions for use.

DuPont™ Perspective® herbicide is not registered for sale or use in all states. See your DuPont retailer or reperesentative for details and availbitiy in your state.

DuPont™ Perspective® herbicide is for use in non-crop applications only and does not have a grazing tolerance.

Grid Resiliency: Preparing for the Inevitable Storms

By Bradley Williams

Hurricane Irene and Superstorm Sandy, almost a year apart, walloped the east coast of the United States like a one-two punch. Combined with other serious storms within the same time frame across North America, they brought to the national fore a renewed political focus on the resiliency of the electric grid, including what can be done to better harden it against outages and what is necessary to better prepare customers for them when they do occur.

Severe weather is the leading cause of power outages in the U.S., according to a new White House report released in mid-August of this year.[1] 'Between 2003 and 2012, roughly 679 power outages, each affecting at least 50,000 customers, occurred due to weather events,' the report noted. Over the same period, 'weather-related outages are estimated to have cost the U.S. economy an inflation-adjusted annual average of $18 billion to $33 billion.' And in 2012 alone, the U.S. 'suffered eleven billion-dollar weather disasters – the second-most for any year on record, behind only 2011.'[2] Two examples stand out:

1. 2012's Superstorm Sandy left 8.5 million customers in the U.S. without power
2. Hurricane Irene, in 2011, was responsible for 6.5 million U.S. customers in the dark.[3]

In Canada, too, the weather experience has been similar. A flash flood in July in Toronto resulted in the province of Ontario's largest blackout since 2003, and severe flooding in June 2013 in Calgary, Alberta, a city of 1.1 million people, took out electricity to much of the city during the flood's peak.[4]

While electric utilities can't promise to be able to completely avoid power outages from severe weather, technology and lessons learned from previous storm experiences can assist utilities in preparing for the next big storm.

The Three Ps

Of the three Ps – planning, preparation and prevention – the latter is nearly impossible without rebuilding much of the grid, but planning and preparation can be continually updated, both by incorporating lessons learned and by utilizing technology and in-application data analytics.

If you think about it, the U.S. electric grid alone – which connects more than 144 million end-use customers with 5,800 major power plants and includes more than 450,000 miles of high voltage transmission lines[5] – can hardly make itself completely impervious to every assault of the increasingly numerous and severe storms affecting the power grid. And continue they will: the National Climate Assessment says the incidence and severity of extreme weather will persist, caused by climate change.[6]

By meshing weather forecasts and recorded damage from previous, similar storms, for example, and analyzing it, utilities can better predict potential damage prior to the onset of the storm, and do their best to prepare for it or pre-place the right people and resources in areas the utility predicts will sustain the most damage. Further, using the same predictive model, the utility can be better able to provide more accurate, outage-specific Estimated Time of Restoration (ETR), key information specific to affected customers and other stakeholders.

Further, robust outage management and distribution network management tools will assist by providing self-healing, autonomous restoration where it is possible to unfaulted line sections, as well as full visibility across the utility's entire grid to more quickly determine the outages problems and address the utility's needs to operate safely, securely, and efficiently during outages while reducing outage durations.

Communication with stakeholders is key

After Hurricane Irene in August 2011 and an early autumn snow storm in October, both of which caused widespread damage in New Jersey, Emergency Preparedness Partnerships (EPP) prepared a report on the emergency preparedness of New Jersey electric distribution companies for the New Jersey Board of Public Utilities (BPU).[7]

In it, EPP pointed to communication as a crucial item in its recommendations:

> "The entire community is dependent on power, therefore, information about power outages and restoration is critical. Effective communication is a key component to the success of an EDC's [Electric Distribution Company's] restoration process. No matter how successfully an EDC conducts its restoration activities, poor and inaccurate communications will outweigh many of the positive aspects of those efforts."[8]

Utilities, by and large, recognize this, and many have turned to social media and mobile channels as customer preferred communication tools during outages. Some rely on outage maps on their websites, and others also use Twitter and Facebook to relay information and ETR updates. "The reality is, you have to get involved where your customers are. It's table stakes. You have to do it," one utility's digital and social media strategist told us about his company's move into social media channels.[9]

In the case of storms, the two-way, instantaneous communication available through mobile and social media channels make them great tools for receiving photos of damaged poles and wires (along with data/time stamps and GPS coordinates, in some cases) and outage reports. These channels also offer utilities the ability to visually communicate restoration effort updates: During Superstorm Sandy, Con Edison (Con Ed) also used social media channels to show the storm restoration process as it was occurring, filming on-the-ground videos of employees showing and talking about what they were doing to restore power in Lower Manhattan, Staten Island and other areas, and then posting them on YouTube. The uptake on these videos was tremendous.[10]

The EPP also told the New Jersey BPU (and this has been reiterated in other reports following Superstorm Sandy) that it is imperative that utilities provide a Global ETR (the time at which power to all customers will be restored) within 24 hours of the end of a storm event.[11] Other utilities, too, are looking more closely at customer communications during outages. On May 31, 2013, Southern Maryland Electric Cooperative, Inc. (SMECO) filed a report on planned improvements to communications systems with the Public Service Commission of Maryland following outages in its service territory from the June 29, 2012, derecho.[12]

In it, the cooperative electric utility noted: "One of the lessons learned from the June 2012 Derecho was that SMECO should strive to provide a more granular and reasonably accurate Estimated Time of Restoration sooner during major outage events." But it also raised an issue many utilities are grappling with, the difference between providing a more accurate global ETR sooner, and providing speculative customer-specific ETRs. "The purpose of releasing ETRs is to allow a utility's customers to plan and take appropriate action to protect their property and ensure the health, safety and convenience of their families," the utility wrote. "It serves no useful purpose to release inaccurate or speculative customer-specific ETRs. Misinformation is more likely to lead to frustration and misdirected customer efforts based on that information."

That said, the cooperative is working to be able to manage customer-specific ETRs at the substation and feeder level within its outage management system. This, it says, would give SMECO the means to begin providing customer-specific ETRs earlier in an event than it can currently. It expects to be able to begin using this new functionality by the end of 2014.

Using technology effectively

As noted earlier, robust outage management and network management tools can also provide a utility with full visibility across its system (aiding in more effective and immediate restoration efforts in order to reduce, wherever possible, outage durations), as well as providing self-healing, autonomous restoration where it is possible.

One large electric utility in the southern U.S. began upgrading its storm response toolbox nearly a decade ago, with an eye to increasing its visibility across the grid with the aid of real-time, decision-driving data. Its service area is subject to a variety of severe weather issues ranging from hurricanes, violent thunderstorms, heavy winds and tornadoes to wildfires, ice and snow, and it's important that it be able to respond quickly and efficiently when a storm takes out the power.

Back in the early 1990s, the utility was relying, like many others, on a series of paper maps on the walls, and printed work tickets. While system operators were extremely familiar with their areas, there was little by way of electronics to help them to quickly aggregate information on outages.

Throughout the years, the utility has continued to upgrade its outage management and distribution management systems, integrating them with its corporate geographic information system (GIS), SCADA, mobile dispatch and advanced metering infrastructure (AMI) systems to better populate its real-time, end-to-end view of its distribution network. In particular, integrating GIS allows it to maintain a single environment for near real-time field data to better support outage management, system analysis, customer information and a web-based viewing platform, while integrating its AMI system allows the operations center to know, on a more granular basis, the extent of the outage.

Being able to combine source data, model data and map data in one place is extremely important in today's outage management, allowing operators to deal with outages, quickly dispatch crews, and give customers estimated restoration times. The more granular data collected before, during, and after the event also allows the utility to proactively identify , analyze and address issues before the next storm outage event. Modern Outage Management Systems must be storm-proven and designed from the ground up to scale to the worst possible conditions. They must support the 'fire hose of data' coming at it in order to process timely and accurate information for the utility to safely and quickly respond. Equally important, the systems must provide customers with their specific information so they can be assured they being taken care of.

In terms of providing ETRs, the utility has come a long way from the good old days of 'best guesstimates.' System-embedded analytics allow the utility's operators, using table-driven parameters to factor in variables (such as shift and season) and 'what if' scenarios, to improve estimates of crew staffing requirements, quickly determine appropriate resources needed and optimize mutual aid strategies.

Operationalizing an understanding of the customer

But while the behind-the-scenes technology has increased the utility's operational efficiency and reliability, it is important to remember the third part of the equation: customer satisfaction.

Most utilities would concur that the operational functionality of its outage management system that its customers care about the most is twofold: an avoidance or reduction in the duration of the outage, and accurate communication regarding the outages, including cause and estimated time of restoration.

Regulators would agree, as has been shown time and time again after the severe storms and widespread damage caused in the past two years alone.

About the author

Bradley Williams is Vice President of Oracle Utilities Global Business Unit's Product Management responsible for Outage Management, Distribution Management, Mobile Workforce Management, Work and Asset Management, and Load Analysis utility applications and Smart Grid Strategy.

Brad had more than 24-years utility technology innovation experience. Prior to Oracle, Brad was a Research Director in Gartner's Energy & Utilities Industry Advisory Services focusing on utility applications of GIS, SCADA/EMS/DMS, Outage and Work Management, and Transmission & Distribution Asset Management research. Prior to being a Research Analyst, Brad directed PacifiCorp's T&D Asset Management responsible for long-term asset strategies and Business Technology that developed and implemented comprehensive IT investment programs. As Director of T&D Infrastructure Planning, Brad was responsible for PacifiCorp's Subtransmission Planning, Telecommunications, and operations Technology Development groups. Brad also worked at Southern California Edison for 10-years where he was involved in transmission system planning, distribution automation, and reliability programs.

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Disaster Planning: Protecting First Emergency Responders

By: Jeff Grosshauser

Disasters of every kind prevail at movie theaters and on TV. Hollywood is skilled at portraying the chaos and life or death drama of disasters of both man-made and natural kinds. However, there are certain realities of these situations that you seldom see.

Imagine a night-time scene that is lit only by the flames of a building on fire. The police have established a perimeter. The fire department arrives with its trucks and hoses. A water supply line is established and just as the valve is about to open, the fire captain shouts into the radio: "Is the electricity off in the building?"

That last sentence adds a final dose of reality omitted in most melodrama. Someone is missing from the usual depictions of emergency response: the utility technician that is ensuring electricity and gas lines are secured. In most cases, firefighters will not put water on a flaming building unless they receive confirmation that utility personnel have turned off the building's electricity. In other situations, restoring power is a race against the clock to maintain order and empower other emergency responders.

In reality, utility personnel are first emergency responders. Their efforts often enable other disaster responses and public safety. Planning for disaster response must include empowering and protecting these brave people.

Utility vehicles are dispatched after the storm passes to repair a local neighborhood outage

Communications is the front line of that empowerment and protection. Communication is always mission-critical. However, there is a big difference between communicating on a routine day and during a crisis. When the sun is shining and the city is safe, most utilities use some combination of public and private communication infrastructure.

However, when disaster strikes public infrastructure is at best unreliable as cellular bandwidth is either crippled by the disaster itself or the bandwidth is taken up with civilian traffic. The utility's own private network is the sole mode of communication.

Two utility workers are operating their handheld mobile computer to complete a request processed by dispatch

The network must be architected to carry all communication in a crisis. That requires a planning process that incorporates worst-case scenarios, best-known methods and a real understanding of the local community from its geography to its potential hot spots in a disaster. Service delivery and personnel safety must share top spot in the priority list.

Disaster Response Prep for Utilities

In planning for disaster response, keep in mind the following utility personnel needs:

Hardened infrastructure: Reliability in a crisis involves a wide range of decisions that must be made long before the crisis. How tall are your towers? The antennas have to be high enough to create the required coverage. How much backup power is available? It needs to sustain the communications system for days. How much bandwidth are you making available? You need enough bandwidth for any conceivable situation.

That infrastructure must also be resilient to withstand cascading issues from storms, floods, and other disasters. The architecture needs built-in redundancy so that it operates when personnel need it. Antenna towers, buildings and equipment also have certain regulations and specifications that have to be followed – such as appropriate grounding – to be useful in a crisis.

Multi-directional communications: Any disaster response situation is dangerous. First responders have unique needs that have to be met amidst the race to fix downed power lines in a major storm or potentially ruptured gas lines in an explosion.

Utility responders need multi-directional communications. They need to coordinate among themselves in the field and with other emergency responders. They also need to be able to talk with dispatch and personnel in the power plant or other centralized facilities. For instance, electrical power lines carry massive amounts of power. The most dangerous part of repairing a broken electrical circuit is the moment when it is switched back on. Personnel at the site and at the Operations Center need to be in constant communication to ensure safety. This need for multi-directional communications has implications for antenna placement, bandwidth, radio quality as well as policies and procedures.

Choosing Technology Providers Wisely

Ensuring efficiency and worker safety is ultimately a question of planning, products and communications infrastructure. Fortunately, municipalities and other agencies do not have to take on this enormous burden alone. While every situation is unique, individual aspects of a situation have likely been seen elsewhere. Advisors and best-known methods are available. When choosing a vendor, it is worth keeping a couple simple things in mind.

Resources: Know how much you are taking on in the planning process. It is a big job with many moving parts and different kinds of subject matter expertise. You need to understand your resources and where you truly bring relevant expertise. Targeting your own resources to areas where you are the experts sheds tremendous light on what you need in a vendor. For instance, items that relate specifically to geography – things like tower locations, existing shelters and private backhaul – might well be an area of focus that your company can take responsibility for. Subjects that involve how much bandwidth is needed for needed applications, required RF coverage, frequency allocation and other technical matters might be areas where a vendor with experience in various localities can add value. A vendor should bring more than just products to the situation. They need to help you figure out the specific design, the implementation plan that minimizes user disruption and then supply the complete solution – both company supplied and other sourced equipment

Be there when disaster strikes: The best vendors are there when you need them. This actually means many things. In an impending crisis such as a storm, resources have to be staged to rush in once the storm passes. A vendor needs to be there to help with that staging. That might mean setting up temporary depots nearby or coordinating with reciprocating agencies. Many states have reciprocal agreements that allow resources to essentially mass just out of harm's way and rush in after the storm passes. A vendor should be ready to be part of the team to help set up networks and coordinate temporary infrastructure.

Severed lines are being repaired by utility workers after a wind storm

Field forces are not the only vendor resource that is precious in a crisis. Radios are precious when people are depending on them to call for help and coordinate field and centralized personnel. Radio vendors should be able to shift their distribution system quickly to redirect radios coming off the manufacturing line to spots that are experiencing disasters or are prepping for impending disasters. Those vendors need strong relationships with other customers who will likely experience a delay in receiving their shipments. Such a vendor can credibly look that other customer in the eye and promise that they will get the same treatment when their moment of need arises.

Disaster preparedness is a necessary part of civic life in the 21st century. As a society, we are prepared to recognize police and firefighters in the emergency responder role. But, utility personnel are also among the first emergency responders in a disaster. They turn off power so fires can be fought. They turn on power so lights and other infrastructure can function. Utilities need a disaster response plan and that plan must be incorporated into a regional response plan. In Hollywood, happy endings are part of the business model. In reality, happy endings are the result of planning, hard work and choosing partners wisely.

About the author

Jeff Grosshauser is Area Sales Manager of North America Energy Markets, which is focused on US Utilities. In this vertical, Jeff leads the sales strategy and product solutions to meet current Energy market requirements and positions Motorola as a long term strategic technology partner with our customers. In Jeff's previous role, he led a similar team focused on Fortune 500 customers. Jeff has held multiple leadership positions in his 28 years at Motorola including Account Management, Strategic Projects, Sales Management and Territory Management. He earned a bachelor's degree in business from Augustana College, IL where he also lettered in football 4 years.

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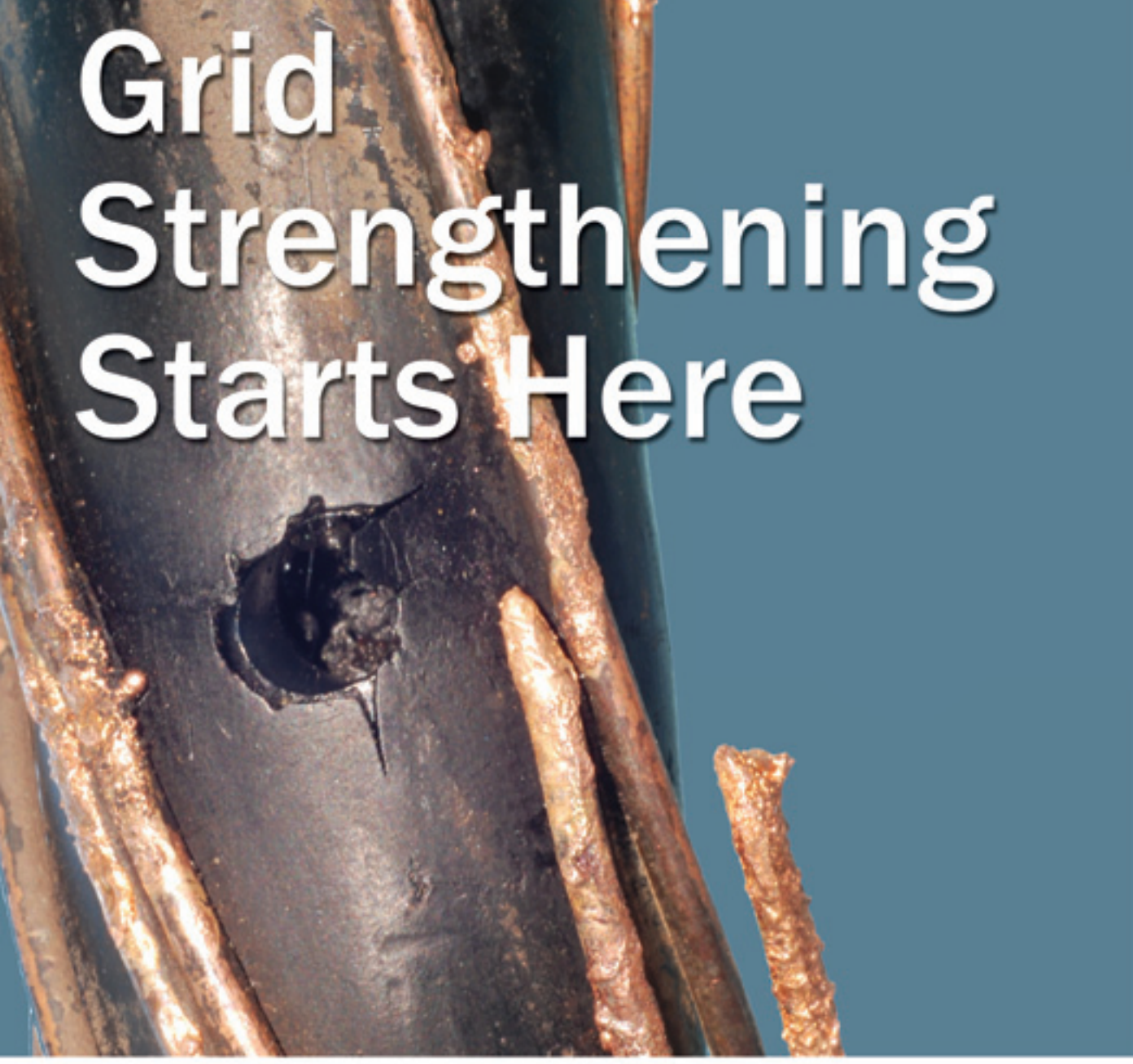

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