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May 2012  
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Vol. 16, Issue 5

# Utility Products

*The Resource for Power, Telecom and CATV Product Solutions*

Features:

## Alternative Power

**EUFMC** Preview

Product Focus:

**Vehicles & Accessories**

**Overhead & Underground**

**Wind Power Construction**

**Computers & Software**

**EUFMC**  
**Williamsburg, Va.**  
June 3-6



**AWEA Windpower**  
**Atlanta, Ga.**  
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**Utility Products®**  
The Resource for Power, Telecom and CATV Product Solutions

Michael Grossman  
Publisher

Teresa Hansen  
Editor in Chief

John Tabor  
Associate Editor  
[john.t@pennwell.com](mailto:john.t@pennwell.com) • (918) 831-9508

Paul Hull  
Contributing Editor

Daniel Greene  
Production Manager

Clark Bell  
Presentation Editor

Chris Long

Senior Regional Sales Manager  
AL, CT, GA, IL, IN, LA, MD, MI, MN, MO, NC, NH, NJ, NM, PA,  
SD, TN, WA, WI, DC  
[clong@pennwell.com](mailto:clong@pennwell.com) • (205) 647-9137  
FAX: (205) 647-9140

Candice Doctor

Sales Director  
AK, AR, AZ, CA, Canada, CO, DE, FL, HI, IA, ID, KS, KY, MA,  
ME, MS, MT, ND, NE, NV, NY, OH, OK, OR, RI, SC, TX, UT, VA,  
VT, WV, WY  
[candiced@pennwell.com](mailto:candiced@pennwell.com) • (918) 831-9884

Glenda Harp

Reprint Manager  
[glendah@pennwell.com](mailto:glendah@pennwell.com) • (918) 832-9301

Sandy Norris

Utility Products Conference & Expo Exhibit  
& Sponsorship Sales Manager  
[sandyn@pennwell.com](mailto:sandyn@pennwell.com) • (918) 831-9115

Dillon Waters

Advertising Traffic Manager

Linda Thomas

Audience Development Manager  
[lindat@pennwell.com](mailto:lindat@pennwell.com) • (918) 832-9254

Frank T. Lauinger  
Chairman

Robert F. Biolchini  
President & CEO

Mark Wilmoth  
Chief Financial Officer

Jayne A Gilsinger

Senior Vice President, Planning, Development  
& Strategic Policy Advancement

### Advertising Offices for Utility Products

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Tulsa, OK 74112  
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Fax: 918.831.9834  
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[info@utilityproducts.com](mailto:info@utilityproducts.com)

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## •EDITOR'SLetter

# In Spite of the Hurdles, Alternative Power is Gaining Momentum



**A**lternative power comes from a variety of sources, and each has its own advantages. This month's feature article, "Alternative Means" by contributing editor Paul Hull, discusses how alternative power sources are gaining speed despite the hurdles. Through history, Hull points out, people have resisted new ideas that could improve their lives. People sometimes don't understand new technologies, and there are those who might see their profits affected by better technologies. The beginnings for coal, railroads, electricity, television, computers and telephones weren't without challenges. For new power sources to succeed, those who adopt, approve, install and equip them must know what they are doing. Alternative energies such as solar and wind power are not isolated ideas promoted by unrealistic people—wind power supports some 75,000 American jobs and, according to Hull, that number could more than triple in the near future. Hull presents how the extension of the Production Tax Credit (PTC), training and quality construction will help alternative power gain momentum.

Another feature article in this issue is "Electric Utility Fleet Managers Conference 2012 Preview." With the theme "Essential Tools for Utility Fleet Professionals," the 59th annual Electric Utility Fleet Managers Conference (EUFMC) will take place June 3-6, 2012, at the Williamsburg Lodge and Conference Center in Williamsburg, Va. The conference will offer a forum where fleet representatives can exchange information and discuss mutual concerns. The annual EUFMC will bring together more than 100 fleet managers from over 50 investor-owned electric utilities, electric cooperatives and electrical contractors in the US, Canada and South America. In addition, this

year's conference has been expanded to meet the need for larger equipment and growing interest by vehicle and equipment suppliers for the electric utility industry. The EUFMC 2012 program will feature presentations by industry experts, manufacturers and fleets; roundtables that address common challenges; and several great speakers. There will also be EUFMC-sponsored activities for families and events specifically for spouses.

Utility Products' also brings you a variety of informative product focus articles this month. Learn more about life-cycle cost analysis to stretch your budget, reducing tire expenses, saving with your air compressor system, protecting ground equipment, spread spectrum time domain reflectometry for utilities, power cable for wind energy systems, computers for harsh environments and time savings, and a geographic information system for the utility communication network.

*John Tabor*

John Tabor  
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• **FEATURE** Story

# Electric Utility Fleet Managers Conference

2012 Preview

## Essential Tools for Utility Fleet Professionals

This year's 59th annual Electric Utility Fleet Managers Conference (EUFMC) will take place June 3-6, 2012, at the Williamsburg Lodge and Conference Center in Williamsburg, Va. The EUFMC theme this year is "Essential Tools for Utility Fleet Professionals," and the conference objective is the sharing of information pertaining to the procurement, application, operation and maintenance of equipment used by electric utilities. The conference provides a forum where fleet representatives can exchange information and discuss mutual concerns.

The first day of the EUFMC begins with a signature drive-thru equipment demonstration followed by an afternoon equipment show. The remaining two days are devoted to the general session agenda of speakers and presentations related to utility fleet management and a roundtable discussion of best practices.

The annual EUFMC brings together more than 100 fleet managers from over 50 investor-owned electric utilities, electric cooperatives and electrical contractors from the US, Canada and South

America. Collectively, these utilities operate more than 275,000 vehicles and employ 4,000 technicians.

This year's EUFMC will feature:

- Opportunities for finding best practices that benefit your company;
- Drive-thru equipment demonstration and exhibition of 60+ displays;
- More than 270 representatives from 100+ manufacturers and service providers available to meet with fleet managers; and
- Networking opportunities with peers at roundtables to address common challenges, share best practices and work with suppliers to find solutions.

Expanded to meet the need for larger equipment and growing interest in the conference by vehicle and equipment suppliers for the electric utility industry, the showcase also includes indoor displays.

The EUFMC 2012 program will feature presentations by industry experts, manufacturers and fleets, including: Injury Trends—Light Duty Vehicles; Life Cycle Costs—Models that Work; Best Practices in Preventive Maintenance; Diesel Engines—Current and Future; GPS/AVL—Looking for ROI; Regulatory/Legislative Update; and Battling the Scales—Bridge Law Compliance.

Roundtables will address common challenges by allowing fleet managers to share best practices and work with suppliers to find solutions. Discussion topics are based on member surveys; for the 2012 EUFMC, topics will include light-duty bucket trucks, green technologies, and data and usage reports, among others.

On Tues., June 5th, keynote speaker Jim Stanley, senior vice president of power delivery for Duke Energy's U.S. Franchised Electric and Gas business, will lead off the annual conference. A 35-year industry veteran, Stanley is responsible for the electric





power transmission and distribution in a five-state service area. Also on Tues., dinner speaker Major Dan Rooney, USAF (Ret.), will address EUFMC attendees. A former F-16 pilot in the Oklahoma Air National Guard, the decorated military aviator served three combat tours in Iraq and was a two-time recipient of the "Top Gun" award. Rooney is also the founder of the Folds of Honor Foundation, a non-profit organization that provides scholarships to the spouses and children of military service members disabled or killed in action.

And then on Wed., June 6th, Bob Lutz will be the guest speaker at the President's Gala Dinner. Lutz, the driving force behind many vehicle advancements in a nearly 50-year career in the automotive industry, is currently a member of the board of directors of VIA Motors. Until his retirement in 2010, he served as vice chairman and special adviser for Design and Global Development at General Motors where he championed the development of the Chevrolet Volt, as well as several

successful Chevrolet, Buick and Cadillac models. Lutz has also held senior leadership positions at Ford, Chrysler and BMW where he was responsible for global car and truck operations and product development efforts. He was also CEO of Exide Technologies, a producer of automotive batteries.

All registered attendees are invited to play in the EUFMC Sunday Golf Tournament. The June 3rd captain and crew (scramble) event will be limited to 36 teams (144 golfers). The first 144 registered conference attendees will be included in the tournament with other registrants placed on a waiting list. As space is available, players on waiting lists will be assigned on the day of the tournament. To maximize the availability for conference attendees, spouses are not eligible to play in the Sunday tournament.

The EUFMC also sponsors activities with opportunities for family participation and events specifically for spouses:

- Sat., June 2—spouse lounge with wine

tasting (for registered EUFMC spouses);

- Sun., June 3—afternoon sightseeing tour of Williamsburg (for registered EUFMC attendees and families);
- Sun., June 3—evening ghost tour (for registered EUFMC attendees and families);
- Mon., June 4—nine holes of golf for spouses (Spotswood Executive Course); and
- Tues., June 5—historic campus tour at the College of William and Mary, followed by a luncheon in the Great Hall of the Sir Christopher Wren Building (for registered EUFMC spouses).

The conference promotes cooperation between manufacturers, suppliers, services and fleet representatives engaged in the development and design of vehicles and equipment associated with the electric utility industry. If you are interested in attending or want to learn more, please visit [www.eufmc.com](http://www.eufmc.com). □

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## •FEATURE Story

***Alternative power sources are gaining speed despite the hurdles.***

By Paul Hull

# Alternative

Throughout history, new ideas for improving people's lives have faced challenges—from people who don't understand new technologies and from those whose current profits could be assailed by better technologies. Think of the beginnings for coal, railroads, electricity, television, computers and telephones. "Inventions of the devil" was a common comment from the ignorant. People still use that phrase to place preventive walls against ideas and products perceived as threatening. When we discuss alternative power sources for commercial and residential customers, we must accept that there will be those who oppose each and every movement forward. On the opposite side

and equally as dangerous are those who are willing to cash in on anything.

Vital to the adoption and construction of new power sources is that the people who adopt, approve, install and equip them should know what they are doing. A large amount of expertise, much of it new, is required. I came across this in a conversation with an "energy expert" about the role of inverters in solar power. He said they soak up power and add to the normal requirements of, say, a household. They don't. They do almost the opposite of that. A grid-tied inverter converts the direct current generated by the solar module into grid-acceptable alternating current. The self-proclaimed energy expert was not an expert in this new

field, just a person experienced in an old field who wouldn't tolerate any change in his complacent job because of some new technology. It reminds me of those who said computers could never do this or that, or tell you that wireless communications were old-fashioned by the end of World War II.

## Growing Industries and Employment

Apart from these frequent challenges to alternative power sources and construction, some of the gained momentum has been enabled by the Production Tax Credit (PTC). For wind energy, that credit expires at the end of 2012, but, having seen the successes of





wind energy installations, senators of both major parties are introducing legislation to extend the PTC.

"I want to applaud Senators Grassley, Udall, Brown, Harkin, Heller, Wyden and Bennet for introducing this important piece of legislation," said Denise Bode, American Wind Energy Association's chief executive. "The support of these Senate leaders, along side the overwhelmingly strong and bipartisan support the PTC extension has received in the House, clearly shows that wind energy is one of the few items of consensus in an otherwise difficult political climate."

Alternative energies such as solar and wind power are not remote, isolated ideas promulgated by unrealistic people who

think their niches should be huge. Wind power currently supports some 75,000 American jobs, and that could more than triple in the near future. That is one reason, apart from its obvious energy benefits, why the proponents of wind power insist on the importance of its role in our future energy picture. Should the wind power PTC expire at the end of this year, some 35,000 jobs will be eliminated. Able Manufacturing, located in Joplin, Mo., had no employees in 2008 and now has 25—with another 10 expected to be added soon. This company manufactures composite parts for wind turbine nacelles and blades, and has doubled its wind energy supply chain since 2008. The possibility of no PTC has already affected orders.

"We have orders through about August," said Able Manufacturing's CEO, Jim Schwarz. "But the orders for September and October are near zero, or none."

Across the country in Kittitas County, Wash., Eric Melbardis, operations manager at EDP Renewables' wind power facility, said: "Our company has projects on the shelf now that we would love to develop, but, because of the uncertainty of the PTC, we're not sure that it's viable right now."

The solar power industry has suffered from reports of imperfect equipment and incompetent companies trying to cash in on what looked like easy pickings, but the real industry has advanced steadily, not only in the available equipment but in the benefits it has brought to many people. Construction has started in Yuma County, near Dateland, Ariz., for the 290 MW Agua Caliente solar project—the world's largest operational photovoltaic (PV) plant. Built by First Solar Inc., Agua Caliente will generate enough clean solar energy to serve some 100,000 average homes per year when fully operational. In addition to First Solar's advanced thin film PV modules, the 2,400-acre plant will feature more than 400 SMA Sunny Central 720 CP inverters.

In continuous operation, the SMA Sunny Central CP inverter series can feed 720 kVA to the grid at ambient temperatures to 77F, 110 percent rated nominal power, resulting in increased power production. These inverters are for use in large, open-field PV power plants such as Agua Caliente. NRG Energy acquired Agua Caliente in August 2011. First Solar will continue to build, operate and maintain the project. Power generated by the installation will be sold to the Pacific Gas and Electric Co.

### Progress Needs Preparation

Training to include product knowledge and operational best practices is as important in alternative power projects as it is in any other industrial or commercial project. Since 2008, ONTILITY has held solar installer classes for business owners, contractors and individuals in Louisiana and Texas. Nearly 3,000 electricians, engineers, contractors, entrepreneurs, displaced workers, career changers and unemployed young people have benefited. In a related area, ONTILITY also operates a solar product distribution warehouse, with multi-million dollar inventory from more

## Alternative Means...

than 100 carefully selected manufacturers. In addition to training and distribution, ONTILITY has a range of partner support services, including engineering and design consulting, proposal support, marketing and sales programs, technological solutions, financial support and due diligence, lease programs and project consulting. You can see that this is not a cottage industry or home garage operation. It's the strong beginnings of a wanted and successful industry.

When Smith & Associates, a global electronics company based in Houston, recognized the problem of resource scarcity and the growing concern for the environment, company executives decided they wanted the firm to be the first in its industry to provide service in an environmentally sustainable and responsible way. They realized that to affect real change within the organization and to have a significant impact, the company needed to address not only the energy needs of its building and operations, but also its environmental and sustainability practices. Smith & Associates, therefore, set out to integrate environmental sustainability into its business operations and culture—to become part of the environmental and energy solution.

To begin the process, Smith & Associates partnered with ONTILITY—a renewable energy and energy efficiency Engineering, Procurement and Construction (EPC) consulting, solar distribution and training company—to create a roadmap for sustainability. The project began with the creation of an employee-driven sustainability group and the commitment to embark on the greening of the company's headquarters, a 60,000-square-foot, 1980s building in northwest Houston. During early discussions, the desire to install solar PV and solar thermal systems was clear. Everyone was aware, however, that without energy efficiency improvements, renewable energy measures would be disappointing. So, the project began with a comprehensive Building Performance Institute (BPI) energy audit to set baselines for efficiency and energy use. ONTILITY then helped Smith & Associates set sustainability goals and develop an implementation plan.

Step one was to make energy efficiency improvements to the 30-year-old building. Because heating, ventilation and air conditioning (HVAC) systems consume large amounts of energy and are significant

contributors to greenhouse gas (GHG) emissions, the existing compressed gas HVAC system was a major target for improvement. It was replaced with air-cooled chiller towers, exterior water pumps and chilled water air handling units. The new HVAC system, which greatly reduces overall energy use and GHG emissions, includes advanced energy management software that enables control of all facets of the HVAC system (air flow, temperature, scheduling, etc.) as well as energy consumption monitoring. The audit also showed significant energy savings were possible by replacing the existing black asphalt roof with a white thermoplastic olefin (TPO) poly membrane cool-roof system to reflect heat and cut air conditioning loads. Additional insulation as part of the roof system reduces ac and heating demand. More efficient interior lighting, light emitting diode (LED) parking

To handle the dc to ac conversion, the four systems feed two, three-phase, 12 kW Fronius IG Plus inverters; two, three-phase Advanced Energy 30 kW inverters; and one, three-phase Advanced Energy 50 kW inverter. To maximize solar power production and handle excess power, Smith & Associates participates in the Renewable Rewards Buy-Back Program from Green Mountain Energy. This set of PV systems would not serve all of its intended purposes without real-time production monitoring, a function provided with the installation of monitoring equipment from DECK.

The solar energy installation also includes a Schuco solar thermal system, which features three commercial solar thermal collectors and produces 115 gallons of 140 degree water daily. This system provides the majority of hot water needs for the building, and, according to the Solar Rating & Certification Corp., will save

### *The project began with a comprehensive BPI energy audit to set baselines for efficiency and energy use.*

lot lights and metal halide exterior building lights were installed with advanced timers and motion sensor controls to reduce unnecessary lighting use.

As these improvements and upgrades began, ONTILITY and its solar integration partner, Solar Community, started planning the solar energy systems. In addition to its primary power production goals, a secondary function for the PV system at Smith & Associates is to serve as a technology demonstration project. Rather than installing a single system comprised of a single module type, brand and size, Smith & Associates executives, in collaboration with ONTILITY designers, chose to install four separate PV systems representing both proven and emerging technologies. The four systems, with a combined capacity of 138 kW, consist of:

- 30 kW of Lumeta Power Ply PV modules,
- 25 kW of SoloPower thin film modules,
- 36 kW of Schuco PV modules mounted on Cooper Arista racking, and
- 47 kW of Sanyo 195W bifacial modules mounted on a custom-built covered parking structure designed by ONTILITY. This facility also includes six GE electric vehicle-charging stations.

3,029 kWh annually. Many commercial buildings might benefit from larger systems; the low hot water requirements of this one allowed for the installation of a smaller system.

With design drawings completed and stamped, permits pulled and the equipment ordered, it was time to assemble the Solar Community installation crew. The project was managed by Janet Hughes, lead solar consultant for ONTILITY, with day-to-day project management and on-sight supervision by Solar Community. Hughes, a pioneer in solar training and workforce development, saw this project as an opportunity to further promote the three-part ONTILITY model.

"ONTILITY was built with training and support services at the core of our business model," Hughes said. "The Smith & Associates project is a strong demonstration of this. ONTILITY designed, supplied equipment and managed the project. We then hired one of our dealer contractors to run the install, and they allowed trainees from our classes to get on-site experience on the project. It is a perfect example of growing a solar workforce." □



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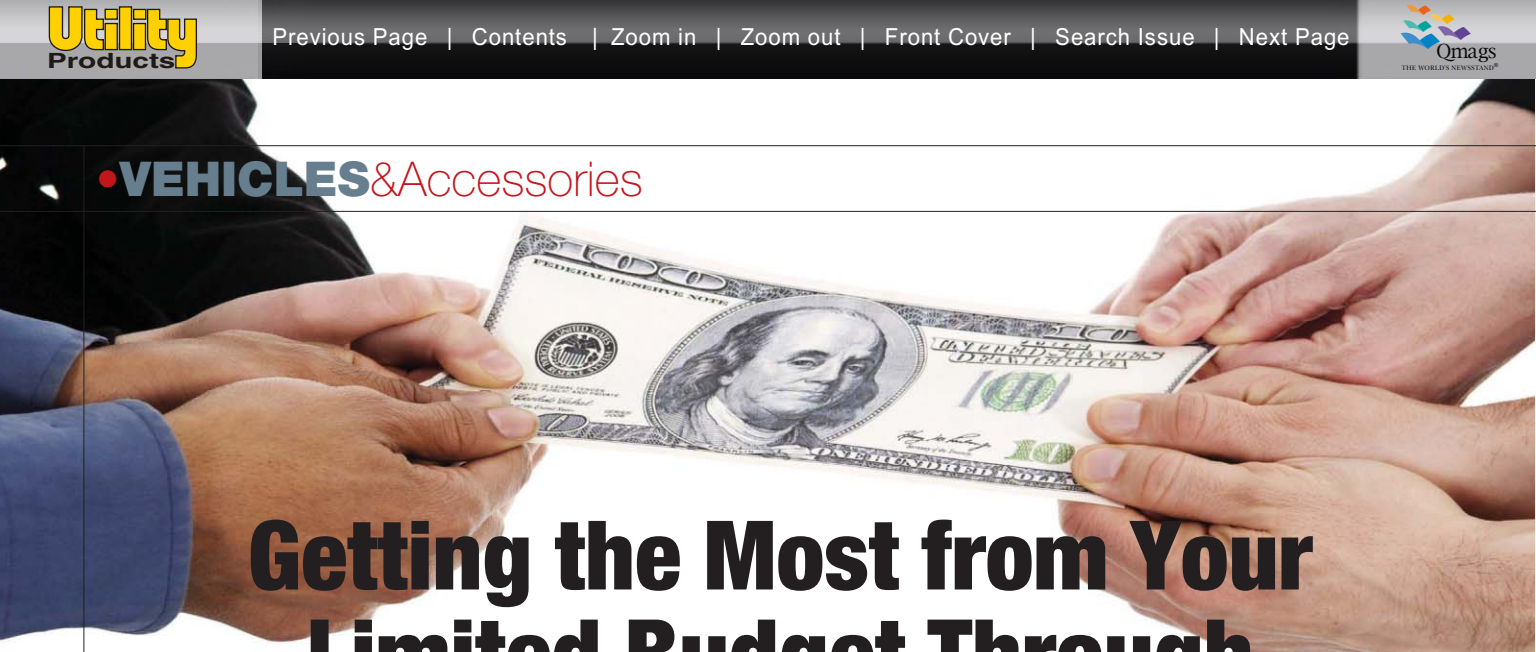
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# Getting the Most from Your Limited Budget Through Life-cycle Cost Analysis

By Robert Johnson

**F**inancial constraints often force fleet managers to make tough equipment decisions. Should I repair a vehicle or replace it? If I do repair it, how much work should I do: just enough to get by or a complete overhaul? Is it better to replace two low-cost units or one higher-cost unit?

In too many cases, the answers to these questions are based on educated guesses or are driven by external decision-makers with their own agendas. One of the best financial analysis tools available to fleet managers for making decisions of this nature is the net present value (NPV) life cycle cost analysis. Instead of relying on guesswork, and not being able to fully defend your position, a NPV life-cycle cost analysis will show you the true total cost of each alternative.

Many fleet managers have used life-cycle cost studies for years. Unfortunately, the usual study only considers direct cash flows. A typical logic thread might be something such as: If I spend \$1,000 today, I will save \$250 a year, which means I will recoup my investment in four years. There are two faults with this type of analysis. First, it does not consider the time value of money. Second, decisions made by a fleet manager working for a tax-paying entity have a direct impact on the taxes the entity pays. An after-tax NPV life-cycle cost analysis addresses both of these issues.

## What is the Difference?

The time value of money is directly related to an entity's cost of money. A

tax-paying business' cost is normally considered to be its minimum acceptable internal rate of return. For a government agency, it is typically the weighted cost of debt—direct loans, bonds, etc. This cost of money, which is normally expressed as a percentage, means that one dollar at some point in the future is worth less than a dollar in hand today. For a given cost of money, the current value of a dollar at some point in the future is known as its present value. The total present values of a series of related expenditures, spread over a period of time, is referred to as the net present value.

If an entity pays taxes, the fleet manager must also consider the true bottom-line cost of an expenditure after taxes. Ordinary expenses reduce gross income, which in turn reduces tax liabilities. This effect is known as a tax shield. If your entity has a total effective tax rate of 30 percent, for example, a dollar of ordinary expenses costs 70 cents after taxes. Capital expenditures, on the other hand, must be depreciated over a period of years, so the NPV of the series of depreciation allowances is less than the actual capital expenditure.

The following is a basic example of a tax shield. Assume your business has a tentative gross profit of \$1,000 for a period, and the effective tax rate is 10 percent. That means that you will owe \$100 in taxes for the period, leaving you with a net income of \$900. If you incur an expenditure of \$100, your gross profit will drop to \$900 and your tax liability will drop to \$90. That means your net income will be \$810, so the

additional \$100 expenditure actually costs you \$90 after taxes. Many businesses have total effective tax rates in excess of 40 percent to 50 percent, so the impact of a tax shield can be significant to the bottom line.

## Using an After-tax, Net Present Value, Life-cycle Cost Analysis

Most fleet managers are not familiar with this type of financial analysis, but available spreadsheet programs perform the calculations once the necessary information is entered. The biggest issue the fleet manager faces with this type of analysis is that it documents the total cost to the entity, as opposed to just the fleet manager's budget. Your financial department is probably familiar with the concept, so, if you are in a position to work with them, you might be able to use this type of analysis to document your stewardship of the entity's budget and get additional funds when justified by your analysis.

When you make an NPV analysis of a series of expense options, the NPVs of the various alternatives will be negative. The option with the least negative cost is the best alternative from a purely financial point of view. Some NPV life-cycle cost spreadsheet programs, such as the National Truck Equipment Association's (NTEA's) Vehicle Life-cycle Cost Analysis Program, will also show your annualized cash flows. If the NPVs of two options are close, these annualized cash flows might be more important than the total cost.

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## Getting the Most...

alternatives, the NPV will be positive if the alternative being considered is earning more than the established cost of money and negative if it is earning less. An alternative can be revenue-generating even if there are no direct income flows associated with it. You may, for example, be considering upgrading a new truck in such a way that it will be more productive. If the operations associated with the existing truck incur a significant amount of labor overtime, the increased efficiency might eliminate that overtime. The loaded overtime rate (\$50 per hour, for example), times the total hours of overtime eliminated (one hour per day x 260 days per year, for example), generates a direct labor savings for the company that can be treated as additional revenue. Using the hypothetical numbers stated, the annual savings (revenue) would be \$13,000.

If the productivity of a new unit is increased to the point it will replace two existing units, the potential savings (revenue) may be greater since you will eliminate the total labor costs of a driver and possibly a helper, as well as the maintenance and operating costs of the second truck. The opposite of this scenario applies when people in your entity want to downsize a vehicle to reduce fuel costs. If this downsizing increases overtime or forces the addition of a second vehicle to get the work done, the fuel savings will probably be less than the other costs incurred.

Even replacing a high-cost unit with a new unit that has a lower life-cycle cost can be considered revenue-producing, since

it may reduce total life cycle expenditures. If you have a vehicle with a lifetime average operating cost of \$1.50 per mile and the truck runs 15,000 miles per year, for example, annual costs will be \$22,500. A new, more fuel-efficient vehicle may have a projected average annual operating cost of \$1.10 per mile, or \$16,500 per year. The cost reductions (revenues) associated with the new unit, therefore, will be \$7,000 per year.

As we have seen, the actual bottom line in these examples is not without some complexity. If you work for a tax-paying entity, the reduction in labor payments will eliminate a tax shield. In addition, the cost of the upgraded vehicle must be depreciated over time as opposed to being treated as a one-time expense. In all cases, the carrying costs—time value of money—must also be taken into account. A properly applied NPV life-cycle cost analysis, however, will take all these factors into consideration and the true costs of each option.

## Ranking Alternatives

If you have many revenue-producing alternatives and only enough money to fund part of them, you can perform an NPV analysis and determine the actual return for each alternative. The individual return rates can then be used to rank the alternatives. Assume, for example, that you have five projects with a total cost of \$450,000, but you have only been allocated \$360,000. An NPV analysis provides the following information:

Project	Cost	Actual ROI	Target ROI
1	\$150,000	18.2%	15.4%
2	\$100,000	20.3%	15.4%
3	\$ 75,000	12.9%	15.4%
4	\$ 25,000	14.6%	15.4%
5	\$100,000	15.1%	15.4%
Total	\$450,000		

In this case, Project 2 has the highest return on investment (ROI) (20.3 percent) and should be funded first. Next would be Project 1 at 18.2 percent. The remaining projects are returning less than the desired ROI, but may still be valid and necessary. Unless there are overriding requirements, such as regulatory compliance, the next project funded should be Project 5, at 15.1 percent. Lacking an ROI analysis, you might have been tempted to fund Projects 3 and 4, which have the same total cost as project 5, but provide a lower ROI.

## Learning More

Although documentation of your operations with accurate NPV cost studies is not something finance people normally expect from the typical fleet manager, it is a means to:

- Maximize the utilization of your limited budget,
- Increase your professionalism, and
- Possibly obtain additional funding. □

*About the author:*

*Robert Johnson is a former fleet manager and currently serves as director of fleet relations for the NTEA, the Association for the Work Truck Industry.*

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# Company Reduces Tire Expenses by \$380,000 Over Five Years

*Savings comes from choosing the right tires for specific applications.*

To perform most installation jobs, linemen know you need the right tools. The same is true when equipping service trucks with tires. When Herb Kramer became fleet and maintenance operations supervisor at OG&E, formerly known as Oklahoma Gas & Electric, the regulated electric utility company's fleet—then consisting of 700 trailers and 1,300 power units—had off-road tires mounted on trucks that spent a majority of the time on the highway.

"That's just one example of how the wrong choice of tire contributed to costs for OG&E that were off the grid," Kramer said.

Of the 1,900 power units the company now has, some 840 are medium-duty to heavy-duty models and the rest are light-duty models (1-ton or less).

"We've always had a strong concern for running a safe and cost-efficient operation," Kramer said. "That's why we looked more closely at how we managed our tire program. What we found was that we didn't have standard tire specifications, and we didn't have set guidelines for tire pressures to get the most tread life out of our tires.

"While tires were inspected, there wasn't a regular regimen and set guidelines established. So, tire pressures varied—sometimes tires were slightly underinflated or overinflated, and that led to problems with premature wear.

"When we work on our company's electrical distribution systems, we all know the importance of measurement, consistency and having the right tools for the job. We needed to do the same with tires."

Kramer began by tracking the performance of existing tires and then, with the help of Goodyear and the local Goodyear dealer, T&W Tire, he looked at different tires that could meet the needs of the



utility. Kramer chose his best drivers and equipped their trucks with new tires so he could evaluate their performance without having external factors affect the results. Kramer tracked the tires' performance using his own spreadsheets.



At the same time, Kramer established regular tire monitoring protocols, which included routine tire inspections and pressure checks by the company's maintenance personnel and drivers, as well as T&W Tire technicians.



Eventually, Kramer settled on a standard set of tire specifications based on what tires worked best for specific jobs. As a result of standardizing its tire choices and establishing regular tire monitoring, OG&E has reduced its overall tire expenses by \$380,000 in five years. More than two-thirds of that number came from reducing the wear rates on its tires.

The company, for example, equips off-road light-duty trucks—mostly 1/2-ton, 3/4-ton and 1-ton Chevrolets with pick-up and cab chassis—with Goodyear's Wrangler SilentArmor ProGrade Technology. With the Wrangler SilentArmor tire, the company gets twice the number of miles from the tire's original tread than it did before it adopted the new tires. Before the Wrangler SilentArmor tire, OG&E got an average of 18,000 to 25,000 miles on the tires' original treads before they had to be replaced because of the rough, muddy and rocky conditions.

"The company now gets up to 50,000 miles on the original treads before the tires are replaced," Kramer said.

For those light-duty units that travel mostly on-highways, the company uses Goodyear's Fortera SilentArmor tires, which feature a less-aggressive tread than the Wrangler SilentArmor. By choosing a tire standard appropriate to specific applications, the company can rotate tires, which improves tire life and lowers overall costs.

Another issue Goodyear helped Kramer resolve: Tires on light-duty line trucks and bucket trucks that service construction sites were particularly susceptible to failures because of punctures. That can translate into roadside service costs to as much as \$200 to \$250 per incident, which doesn't include the cost associated with lost productivity.

To help reduce the issues associated with tire punctures, OG&E began equipping the



steer positions on eight units with the Goodyear G287 HSS with DuraSeal Technology. DuraSeal Technology is a gel-like, solvent-free compound built into the inner liner of the tire. It can instantly and consistently seal punctures up to 1/4-inch in the tread area without the need to repair the tire until it is retreaded. This allows drivers to continue operating after a tire is punctured. It does not, however, seal sidewall punctures.

"During the trial period, we had absolutely zero problems because of punctures," Kramer said. "Before we started using the DuraSeal tires, we could expect as many as three vehicles to require roadside service as a result of tire punctures in that same time period."

Now the company uses the Goodyear G287 HSS tires on all tire positions on those eight units. On the commercial truck or medium-duty and heavy-duty truck tire side, OG&E uses the Goodyear G287, Goodyear G647 and the Goodyear G661 in sizes 225/70R19.5, 11R22.5, 12R22.5 and 11R24.5.

On the steer position, the company uses the Goodyear G287 HSS, an all-position tire with a high-mileage tread compound and a casing that offers enhanced toughness for loads up to 10,200 pounds at 130 psi. It has penetration protectors to help resist stone drilling for retreadability. The company also uses the Goodyear Unisteel G647 RSS and is now starting to use Goodyear's new G661 HSA, which replaces two other Goodyear steer tires. The G661, with a 22/32-inch tread depth, offers a scrub-resistant tread. It also features multi-compound construction, which helps extend life when used in local applications that require frequent turning, backing and braking. And, it has TredLock Technology with interlocking microgrooves to help stabilize the tread for long tread life and enhanced durability.

On the drive position, OG&E employs the Goodyear G182 RSD, the Goodyear G622 RSD and the Goodyear Unisteel G177, a lug tire with a 32/32-inch tread depth, a tread design for high traction and a compound for severe off-road conditions.

For its low-boy trailers, which carry equipment such as road tractors and skidders to off-road sites, OG&E uses the Goodyear Unisteel G104 RST in size 255/70 R22.5. The G104 features sidewall wear indicators to help give early wear warning from excessive scrubbing.

"We don't use one standard all-position, steer or drive tire throughout our fleet because our trucks operate in such varied conditions," Kramer said. "The trucks that run in more rural areas are generally heavier duty and require tires with more aggressive tread patterns and heavier load ratings."

"Since the all-position Goodyear G287

HSS offers a greater tread volume for enhanced mileage, for example, it's a tire that's more appropriate for those units that operate in construction sites.

"The type of tire and tread pattern we use really depends on the conditions the trucks are likely to encounter. We find that using the right tire for the right application helps us reduce costs."




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## Tire Expenses...

For economical and environmental reasons, OG&E has T&W Tire retread heavy-duty truck tires using the Goodyear precure method. Before it standardized the size of tires it runs, however, the company was specifying new heavy-duty trucks with size 12R22.5 tires on the steer position and 11R22.5 tires on the drive position. So, the company couldn't retread the steer tires for use on the drive position. Now that Kramer uses the same tire size all around, the company can re-use the steer tire casings by having them retreaded for the drive position.

"Retreading not only aids our standardization and environmental stewardship efforts, but it also helps in our efforts to reduce life cycle costs associated with tires," Kramer said. "We've relied heavily on Goodyear and T&W Tire to help us with our tire program—from choosing the right tread patterns to establishing a process for on-site inspections and a regular schedule for tire replacement." □

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**OG&E**  
OG&E, with headquarters in Oklahoma City, is a regulated electric utility company with 782,000 customers and generating capacity of 6,600 megawatts at nine power plants and three wind farms. Some 60 percent of the power the electric company generates comes from coal-fired plants, 38 percent from natural gas-fired plants and 2 percent from wind farms.

Its service territory covers 30,000 square miles in Oklahoma and western Arkansas. The company operates a fleet of 1,900 trucks and some 700 trailers. The fleet operation services the company's electrical transmission and distribution facilities and its natural gas transmission lines.

Since the company's trucks do much off-road work servicing transmission lines, pipelines and remote facilities, the utility company needs an off-road tire that can handle the terrain and changing ground conditions. The company trucks, however, can also be called on to help other utilities when there are disasters. The tires must be prepared to handle various road conditions when they travel hundreds of miles from the company's service territory in Oklahoma and western Arkansas. In 2005, for example, the company helped Louisiana utilities cope with the aftermath of Hurricane Katrina.

OG&E's light trucks range in size from 1/2-ton and 3/4-ton, mostly Chevrolets, with pick-up and cab chassis up to 1-ton. The light trucks are for meter reading, field technician work, fleet maintenance and substation operations.

The company's medium-duty trucks are all Internationals—Models 4300, 4400, 5600 and 7400. They are used for technician work and are equipped with buckets and diggers.

The company's heavy-duty trucks are a mix of International, Peterbilt and Kenworth models.

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# Extreme Reliability: Saving With Your Air Compressor System

## *Making the Best Green \$ Decision*

Fleets have been buffeted by the economic storm for the past several years. Historically, counties and cities have shown recovery from recessions as long as 18-24 months following national economic recovery because of the lag in tax revenue collection associated with an economy in recession. In the US, the National League of Cities has expressed concern that the current downturn will last longer in certain areas since property tax revenues may be reduced longer than anticipated because of depressed property values. In addition, business tax revenues will continue to be weak because many small businesses have failed to weather the crisis, and there are fewer new business startups.

### **Pressure to Expand Green Fleet Initiatives**

Despite budget constraints, green initiatives continue to gain priority throughout the public works and utility fleet industry. Political support for carbon friendly, low-emission vehicle technologies, along with funding through the federal stimulus package has provided fleets the opportunity to acquire additional green vehicles and equipment.

Support for green fleets is expected to

continue despite increasing pressure to reduce costs. Reducing emissions and fuel consumption continue to lead the response to these initiatives. This often means looking at more fuel-efficient tools, equipment and vehicle accessories to add value to this greening effort.

Fleet managers continue struggling to avoid the trap of making the wrong decision

for what appears to be the right green choice, and choosing the right air compressor system can be part of this challenge.

Consider the following examples:

- Truck mounted diesel—A 2011, 6L 300-hp diesel work truck uses 50 hp to produce 150 cfm and 0.01 g/hp-hr pm (maximum allowable emissions per EPA regulations); and





- Skid mount diesel drive—A 2011, 10-hp diesel engine uses 10 hp to produce 30 cfm at 0.3 g/hp-hr pm (maximum allowable emissions per EPA regulations).

A job that takes 10 minutes with the truck mounted, 150-cfm air system will produce a total of 0.0833 g/hp-hr, while the same job with the skid mounted 30-cfm compressor can take up to five times as long (50 minutes) and produce a total of 2.499 g/hp-hr. This produces 30 times more, not including additional energy and resources required in the manufacturing process to build, and eventually dispose of, two engines instead of one.

A smaller, more fuel-efficient system does not necessarily mean green. Cost savings must take into account fuel, labor and the loss of resources (water losses from a broken water main, for example, that can't be promptly repaired when equipment and human resources are tied up at another job).

### Condition Extremes

Regardless of location, fleets are

expected to operate in freezing climates, intense heat environments and in heavy precipitation—when demand can be greatest. Finding an air compressor that is designed for these conditions can go a long way toward addressing budgetary and environmental concerns.

From fuel and lubrication to equipment readiness to ability to perform to reliability, the design and characteristic of the air compressor a fleet uses can have a direct impact on the organization's biggest concerns.

Some specific air compressor system features can reduce issues that might arise in extreme weather conditions:

### Cold Climates

- Specially designed compressor oils, particularly synthetic blends, ensure reliable performance and reduction in equipment issues and maintenance problems.
- Pre-use preparation, such as compressor oil warming to ensure correct viscosity and appropriate hydraulic pressure (cold climate kit or digital control warming stage), also contributes to cost savings

and reduced environmental impact.

- Maintaining recommended hydraulic oil viscosity ensures equipment longevity and reduced operating costs.

### Hot Environments

- Air compressors equipped with a variety of system temperature probes ensure hydraulic and compressor fluid temperatures do not exceed recommended limitations by allowing system shutdown with a safety circuit.
- Air-liquid cooling through a dual core cooler with a dedicated electric fan prevents temperature excesses.
- Equipment color and material, such as light colors for reflecting heat and lightweight aluminum panels for superior temperature conduction, keeps equipment in an ideal operating temperature range.

### Heavy Precipitation

- Weatherproofed electrical connections ensure uninterrupted operation and reduced maintenance needs.

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### Vehicle-mounted Air Compressors and Extreme Weather Conditions

Given the range of services provided by utility fleets and public works, performing in extreme weather conditions—intense heat, severe freezes, dangerous snow events, heavy precipitation and strong

winds—is considered mandatory. The public relies on public works and utility fleets for their safety in these extreme conditions. Fleets, therefore, must be able to rely on their vehicles, equipment and tools when these situations arise. Choosing the right vehicle-mounted air compressor can ensure reliability at these times as well as quick response while still addressing budgetary and environmental concerns.

### Types of Vehicle-mounted Air Compressors

Most vehicle-mounted air compressors offer a variety of features that allow them to perform in extreme conditions while addressing budgetary concerns and environmental impact. Not all air compressor systems have all the necessary features or are reliable in those circumstances. The types of vehicle-mounted air compressors that can manage these conditions are as follows.



#### Gas/Diesel Drive

This is a portable or mounted, self-contained compressor system. These compressors can be found skid mounted, chassis mounted or trailer mounted, and are referred to as a tow behind.

- Extreme weather features: may include insulated enclosures, electric battery warmers, oil pan warmers, oversized cooler or block heaters;
- Budget considerations: transferability between vehicles, appropriate-size engines for fuel consumption; and
- Environmental benefits: running a smaller engine reduces exhaust and fuel use.

#### Power Take-off Direct Drive and Power Take-off Shaft Drive

Both these air compressor systems are driven off a power take-off (PTO) mounted to the vehicle's transmission or split off the

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vehicle's drive shaft. These typically represent larger, 100 cfm and over compressors.

- Extreme weather features: may include oversized cooler, generally open to the elements;
- Budget considerations: initial install costs are higher, only utilizes the vehicle engine; and
- Environmental benefits: powered by one engine, requires maintenance of one engine, fewer enclosure components (less raw materials used).

#### PTO Hydraulic Underdeck

This is similar to above deck and PTO direct drive and shaft drive underdecks. The PTO hydraulic is powered by a hydraulic pump driven by the PTO. The difference is that the components are mounted under the vehicle, rather than on top.

- Extreme weather features: may include hydraulic tank heater or an extra hydraulic cooler;



- Budget considerations: initial install costs are higher, only utilizes vehicle engine, less equipment allows for purchase of an additional time, labor and money saving piece of equipment; and
- Environmental benefits: powered by one engine, requires maintenance of one

engine, fewer enclosure components (less raw materials used).

#### Underhood

The rotary screw air compressor system is integrated with the truck engine and fully contained under the hood. Compact and

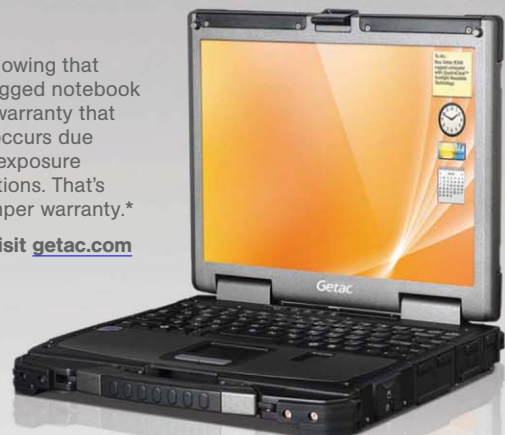
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## Extreme Reliability...

powerful, these compressors can produce up to 175 psi and up to 150 cfm.

- Extreme weather features: systems are tied to vehicle cooling system—they automatically benefit from the cooling function in extreme heat conditions and the heating function in extreme cold, mounted under hood they are protected

from excess precipitation;

- Budget considerations: uses one engine, reduced weight/payload, decreased idling and emissions, lighter weight construction material, no receiver tank, more compact size reduces required vehicle size, reduced fuel and insurance costs, one less piece of equipment



allows for purchase of an additional time, labor and money saving piece of equipment; and

- Environmental benefits: uses one engine, variable speed throttle controls, reduced vehicle weight, improved equipment performance reduces fuel consumption.

### Hydraulic Above Deck

This may be a smaller, reciprocating type compressor or a larger, more powerful rotary screw system. It is mounted on the truck deck and usually packaged in a metal enclosure. It's run by hydraulic power, typically from a PTO or sometimes from an engine-driven clutch pump.

- Extreme weather features: may include automatic cold-sensing, pre-warming of hydraulic oil, soft start, cooler bypass check valve;
- Budget considerations: all components needed to run hydraulics, initial cost of bare compressor can be lower, one less piece of equipment allows for purchase of an additional time, labor and money saving piece of equipment; and
- Environmental benefits: throttle-enable functions, soft start, unload and standby modes.

### Conclusion

When making a choice on a vehicle-mounted air compressor system, fleet managers need to take into account their key concerns—tight budgets and environmental impact—as well as the equipment's ability to handle extreme weather conditions. Longevity and reduced maintenance needs contribute toward improved budgets, while proper equipment reduces the environmental impact. □

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• **OVERHEAD** & Underground

# Best Practices for Protective Grounding Equipment

By Matt Dell

**T**he Occupational Safety and Health Administration (OSHA) and the American Society for Testing and Materials (ASTM) have established specifications and proper procedures for installing temporary protective grounds. These grounding methods are followed by linemen every day as they work on or near power lines. But, everyday use has created a concern that grounds and jumpers might simply be viewed as a necessary tool. They are taken for granted.

To the contrary, protective grounding devices are a complex assembly, both electrically and mechanically. They have multiple functioning components that can become compromised; some are not easily detected. To ensure grounds and jumpers are reliable, they must be properly cared for and regularly tested along with the auxiliary tools used to install protective grounds.

## Why are Grounds and Jumpers Important?

Grounding devices are designed to help protect line workers and the public from inadvertent electric shock. Safety professionals cite several incidents where line workers can be exposed to a potentially deadly situation:

- Human error, which no one can predict;
- Higher loads on today's systems;
- Lightning;

- Static build-up;
- Induced Voltage—feedback—from adjacent circuits;
- Mechanical or equipment failure;
- Switching errors;
- Stored charges from capacitors; and
- Faulty automatic re-closing devices.

It is critical that knowledgeable people make good decisions when selecting grounds and jumpers. Improper selection for the wrong voltage can be deadly.

## Making Good Choices

Since 1960, Hi-Line Utility Supply has built over 500,000 ground sets. Two types of grounds and jumpers are commonly used: personal grounds and running grounds.

- Personal grounds are portable devices that temporarily connect a de-energized conductor or pieces of equipment to electrical grounds prior to beginning work. Line workers usually carry sets of personal grounds on their trucks, based on the conductor sizes they are servicing.
- Running grounds connect and ground a moving conductor, such as adjacent spans of conductor. Running grounds are also deployed after a storm to ground downed power lines to protect line workers and the public until circuits and structures can be restored. OSHA Title 29 of the Code of Federal Regulations, OSHA 1910.269 (n) (4) (i), states: "It is the utilities' responsibility to provide 'protective grounding equipment' that 'shall be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault.'"

The key word is "capable." The industry is clear about proper usage and installation of grounding devices, but it is important to



Grounds and jumpers should immediately be removed from service if there are any signs of extreme wear and tear. Professional refurbishment can salvage the usable parts and restore old equipment to like new.



## Grounding Devices Components

A protective grounding device is typically made up of three components:

**Clamps:** These can be made of copper or aluminum alloys. The clamps on ground sets that accept hot sticks can be configured with a threaded clamp attachment for a permanent hot stick connection or a temporary eye connection for a Shepherd's Hook type hot stick. Clamps must be size-compatible based on industry standards and configured to match the conductor or equipment they will be used on.

**Ferrules:** These are the components that attach the stranded grounding cables to the clamp. They are built to industry specifications and include a grade number based on the conductor size they are designed for. Ferrule cable connections include screw compression or crimping to the cable lead.

**Cable:** With a durable protective covering, cable is sized and rated to the intended conductor and constructed to the safe and appropriate length of the job site's physical condition.

ensure they are in operable working condition. There are two ways grounds and jumpers can be procured: custom built or pre-assembled.

## Custom Built Grounds and Jumpers

When deciding on a custom-built ground set, there are many options to choose from to build it. Hi-Line will build to your exact specifications, including:

- **Clamps:** clamping size range, current capacity, application clearance, terminal connection type (threaded or pressure type), jaw shape and configuration (smooth or crosshatching);
- **Cable:** length, jacket type, durability and adequate capacity to withstand maximum potential system fault, current magnitude and full time duration;
- **Ferrules:** aluminum or copper, fit cable size and connection type to match clamp (threaded or pressure type)—aluminum or copper ferrules can be used with copper cable;
- **Support stud:** recommended on only one clamp to help control lifting (hot stick)

the set to the first clamp attachment point; and

- **Shrink tubing:** recommended for stress relief at the flex point next to the ferrule connection, translucent sleeve allows cable strands inspection between ferrule and jacket.

## Pre-assembled Grounds and Jumpers

A second option for ground set selection is pre-assembled ground sets. There are several options to choose from, including the cable's length, size and color. Ground sets are built with shrouded, threaded copper ferrules and shrink tubing at the connection, which provides strain relief properties. Chart 1 illustrates options for pre-assembled grounds and jumper sets.

An important factor in selecting your ground sets is ensuring a knowledgeable and experienced person verifies the ground sets you've chosen are compatible with the circuit size and rating requirements of the intended use and worksite environment.

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## Best Practices...

### Inspection, Maintenance and Testing

Protective grounding devices might look indestructible, but they aren't. Several factors can compromise their safe working capability:

- Extreme voltage;
- Wear and tear;
- Rough treatment;

- Accidental pinching;
- Moisture;
- Nicks, cuts and scratches; and
- Dirt and corrosion on clamps and heads.

### Visual Inspections

The factors listed here underscore the need for inspection, immediately before and after each use, as the line worker is

cleaning (wire-brushing) and properly storing ground sets for future use. He or she might be the only one who has witnessed an event that could potentially compromise the integrity of the ground set.

The American Society for Testing and Materials (ASTM) International F 855 04 and The Institute of Electrical and Electronics Engineers (IEEE) Standard 1048-2003 provided several anomalies to watch for:

- Cable determination, particularly where the cable flexes next to the ferrules;
- Flattened or smashed section of the cable;
- Broken cable strands near the connection points;
- Corrosion often indicated by swollen cable jacket or soft spots;
- Damage, split or cracked clamps;
- Wear on the clamp jaws;
- Wear on clamp tightening bolt threads;
- Difficult to operate threaded clamping mechanism; and
- Loose connections between the cable and clamps or the ferrules and clamps.

### Best Practices for Testing: Fiberglass Equipment

	After Every Job	1 Year	2 Years	If Damage Suspected
Universal Hot Sticks	Optional	Recommended	Required	Required
Shotguns/ Grip-All	Optional	Recommended	Required	Required
Telescoping Sticks	Optional	Recommended	Required	Required
Hot Arms	Optional	Recommended	Required	Required
Fiberglass Tools	Optional	Recommended	Recommended	Required
Ladders	Optional	Recommended	Recommended	Required
Platforms	Optional	Recommended	Recommended	Required

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Cable Length	1/Ø Yellow	1/Ø Clear	2/Ø Yellow	2/Ø Clear	4/Ø Yellow	4/Ø Clear
3'	HLGA10Y-03	HLGA10C-03	HLGA20Y-03	HLGA20C-03	HLGA40Y-03	HLGA40C-03
6'	HLGA10Y-06	HLGA10C-06	HLGA20Y-06	HLGA20C-06	HLGA40Y-06	HLGA40C-06
8'	HLGA10Y-08	HLGA10C-08	HLGA20Y-08	HLGA20C-08	HLGA40Y-08	HLGA40C-08
10'	HLGA10Y-10	HLGA10C-10	HLGA20Y-10	HLGA20C-10	HLGA40Y-10	HLGA40C-10
15'	HLGA10Y-15	HLGA10C-15	HLGA20Y-15	HLGA20C-15	HLGA40Y-15	HLGA40C-15
30'	HLGA10Y-30	HLGA10C-30	HLGA20Y-30	HLGA20C-30	HLGA40Y-30	HLGA40C-30
45'	HLGA10Y-45	HLGA10C-45	HLGA20Y-45	HLGA20C-45	HLGA40Y-45	HLGA40C-45
50'	HLGA10Y-50	HLGA10C-50	HLGA20Y-50	HLGA20C-50	HLGA40Y-50	HLGA40C-50
75'	HLGA10Y-75	HLGA10C-75	HLGA20Y-75	HLGA20C-75	HLGA40Y-75	HLGA40C-75

Chart 1. Options for pre-assembled grounds and jumper sets.

When a defect is discovered, the grounding device must be taken out of service and refurbished by a person dedicated to building and repairing protective grounding devices.

## Electrical Testing

Visual inspection is only one part of best practices for ensuring grounds and jumpers are in good working order. Some damages or deterioration might go undetected. Maintenance intervals for electrical testing have not been mandated, but a best practice utilities and contractors must establish is testing methods and planned intervals for each grounding device based on industry protocol and the type and frequency of work.

For proper electrical testing, grounding devices must be disassembled and each component—clamps, cable and ferrules—tested separately. Once reassembled, the ground set must also be tested as a complete assembly. The testing process should be performed by skilled and experienced personnel. The industry trend towards downsizing points to outsourcing these critical procedures to a professional third party. Hi-Line Utility Supply tests and refurbishes approximately 400 sets of grounds and jumpers per week. Testing intervals and a date tag for each device can be established, based on company specs. A tagging program alerts crews that are conducting pre-use and post-use inspections of upcoming test interval expiration dates.

## Auxiliary Tools

Hot sticks are often used for proper installation of grounds and jumpers. These auxiliary tools must be in operable working order. ASTM F711-02 has established testing intervals and proper use of fiberglass tools, including hot sticks. Hi-Line Utility Supply cleans, refurbishes and tests over 80,000 fiberglass tools per year.

## Confirming De-energized Status

A report on protective grounding devices best practices wouldn't be complete without addressing voltage detection equipment. Depending on the circuit, line workers must perform a voltage test immediately before installing a protective grounding device. This

confirms the lockout and tagout, and assures the worker the line has not been re-energized.

## Summary

Safety professionals and the men and women working on power lines have done an admirable job of making the work place safer for line workers and the public. Above and beyond OSHA, ASTM and IEEE guidelines and requirements, good decisions must be made for their proper selection, care and testing. □

*About the author:*

*Matt Dell is the owner of Hi-Line Utility Supply, a provider of lineman's transmission and distribution tools and equipment since 1960. Hi-Line assembles custom grounds and jumpers to exact customer specifications. With over 10,000 items in stock, Hi-Line guarantees every in-stock order placed by 4 p.m. Eastern Standard Time will ship the same day (except items requiring assembly and testing). Hi-Line also offers tool repair, fiberglass refinishing and rubber goods testing.*

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### Best Practices



	After Every Job	1 Year	If Damage Suspected
Grounds	Optional	Optional	Required
Jumpers	Optional	Optional	Required

• **OVERHEAD** & Underground

# What Spread Spectrum Time Domain Reflectometry Means for the Utility Market

By Ron Vogel

Electric utility systems become more complex each day as new features, technologies and capabilities are added. Smarter ways of generating and distributing electricity, such as smart metering and alternative energy sources, raise the complexity level and create a need for more real time information. To meet these new needs, there are new technologies that have been incubating and are now ready to be brought to market.

## A New Technology Brought to Market

If something goes wrong with these new systems, the utility immediately wants to know about it and how to provide reliable electric power for its customers. But, what happens when intermittent conditions trip sensors? Crews respond, shut down power, and check the circuits and equipment at the trouble area. They find nothing, however, because the conditions that caused the intermittent condition do not exist when they are on-site.



What if a technician could look into the electrical conditions of any size cable at any voltage, while they are energized and carrying current, to see intermittent shorts or arc faults occurring and instantly be able to locate the exact location of these events? What if you could detect, locate and time stamp the event and characterize the problem while the electricity continued to flow? A new technology is making its way to market, and the impact on how faults are discovered

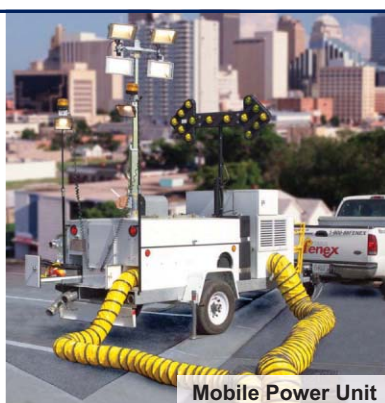


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and corrected will change the utility field.

The new technology is an advanced form of Spread Spectrum Time Domain Reflectometry (SSTDR), and it is being developed for commercialization by two American companies for applications in the electrical utility market, as well as other electrically oriented industries.

Traditional Time Domain Reflectometry (TDR) technology has long been used by electrical utilities to help locate cable failures, cable length information and cable problems that are not visually apparent. These forms of TDR technology, some more than 40 years old, are limited to unpowered dark cables because the voltage and current conditions interfere with the type of reference pulses the older testers use.

Spread Spectrum technology was first used during World War II in secure submarine communications. In the 1990s, Qualcomm developed a version of this concept to help cell phones connect over frequency signals that would degrade and block cell signals. The reason someone in Hong Kong can dial a number in the US and reach the right person is primarily because of Spread Spectrum implementation. What has successfully happened in the wireless world is about to happen in the wired world.

### Time Domain Reflectometry Capabilities

SSTDR technology promises to revolutionize the way a utility will use TDRs to find and fix cable faults, both underground and overhead. It will make it easier to see what is happening and where it is happening on live energized circuits on all equipment types and over all conditions, at any voltage or current level, transmission or distribution.

A traditional TDR cable fault finder sends a generated pulse through a cable to seek out variances, such as opens and shorts. The reflected pulse is compared with the delay at the speed of light, which is translated into a distance measurement to the "event." Old style TDR's can only work correctly when the cable they are "shooting" is unpowered. This is because the line's voltage noise interferes with the pulse, and, therefore, the reflection gets lost in this noise.

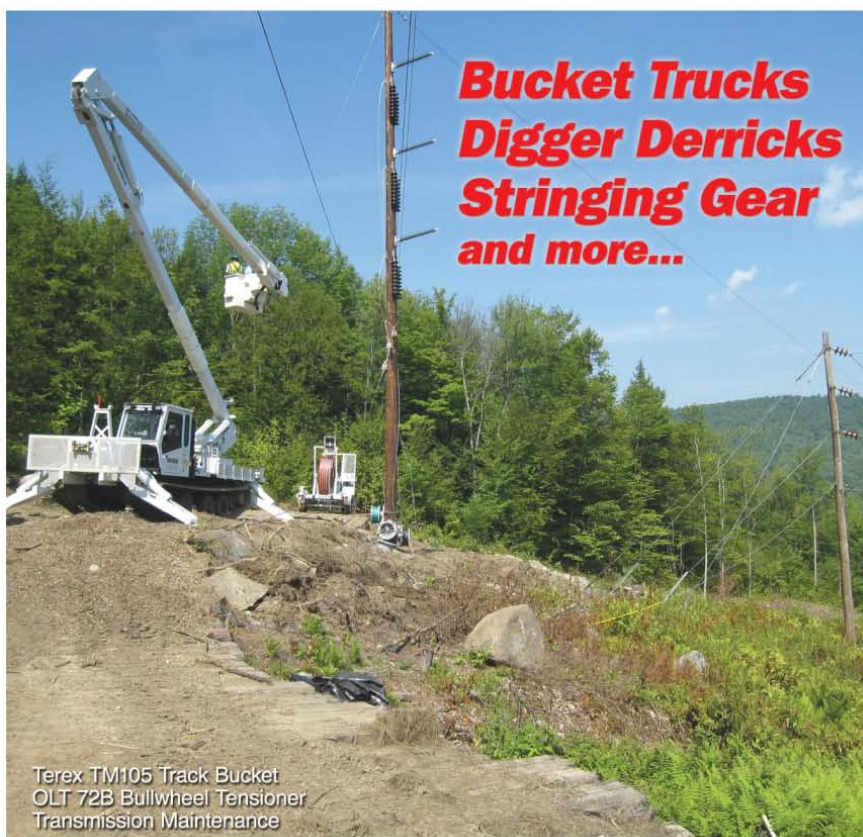
Advanced SSTDR resolves this limitation by generating pulses at a broad selection of frequencies that spread over the spectrum and skip through noise and signal impediments on the cable, while it is energized, to find exactly where the fault occurs, when it occurred and



what its characteristics are. So, cable faults can be found, pinpointed and characterized without taking the circuit down and out of

the system. In addition, unlike older TDR technology, SSTDR can perform dynamic testing that can monitor an energized cable system while it is under load or stress and wait for a fault to occur. This is useful in instances of intermittent arc fault conditions caused by wind, water intrusion or rogue voltage surges.

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## Spectrum Time...

and won't require damaging cable to find the exact location of the fault as is now done with some thumping techniques. By generating selective pulses at specific frequencies, locating pinholes in underground cable will become easier, cost less and be less intrusive to the overall system.

The technology's sensitivity and

flexibility offer another possibility. By using new, patented capacitive coupling techniques, utility technicians will be able to clamp onto conductor insulation without touching bare conductor or disconnecting anything—and continuously monitor the lines to detect, locate and wirelessly report intermittent problems.

## Who is Using the Technology?

Advanced SSTDR technology is now embedded in new flightline test equipment for the US Navy on aircraft carriers. Advanced SSTDR is a natural addition for aerospace applications to find arc faults in aircraft wiring that cannot be detected in installed wiring systems. It is being used by Halliburton to develop safer monitoring systems for offshore drilling rigs. Volvo is using it to develop 24/7 monitoring of the entire electrical control systems on their new heavy-duty trucks.

Schneider Electric has tested the technology on energized lines up to 33 kV, and it has performed flawlessly. So, utility applications are being investigated by this company and others who design and produce equipment for power systems.

## What it Means for Utility Systems

The detection, location and characterization of intermittent electrical faults on live energized conductors can now be easily done, which will create safer electrical networks and allow service organizations to keep networks running smoothly. Smarter street lighting systems that self report outages of strings of lights or individual lamp failures can be designed into existing equipment with embedded modules. Smart grids can become smarter and more informative for the owners.

## Conclusion

An emerging technology such as SSTDR will make a lasting and important contribution to the utility industry in the form of handheld, portable test equipment and embedded in electrical control systems as a safety feature for every cable run.

Advances such as this will enhance newer smart grid system reliability. As they say, knowledge is power, and SSTDR technology will provide more knowledge to electrical grid owners on all transmission and distribution levels. □

*About the author:*

*Ron Vogel is CEO of T3 innovation and can be reached at [rvogel@t3innovation.com](mailto:rvogel@t3innovation.com). T3 Innovation is dedicated to providing the latest and most effective handheld test equipment technology.*

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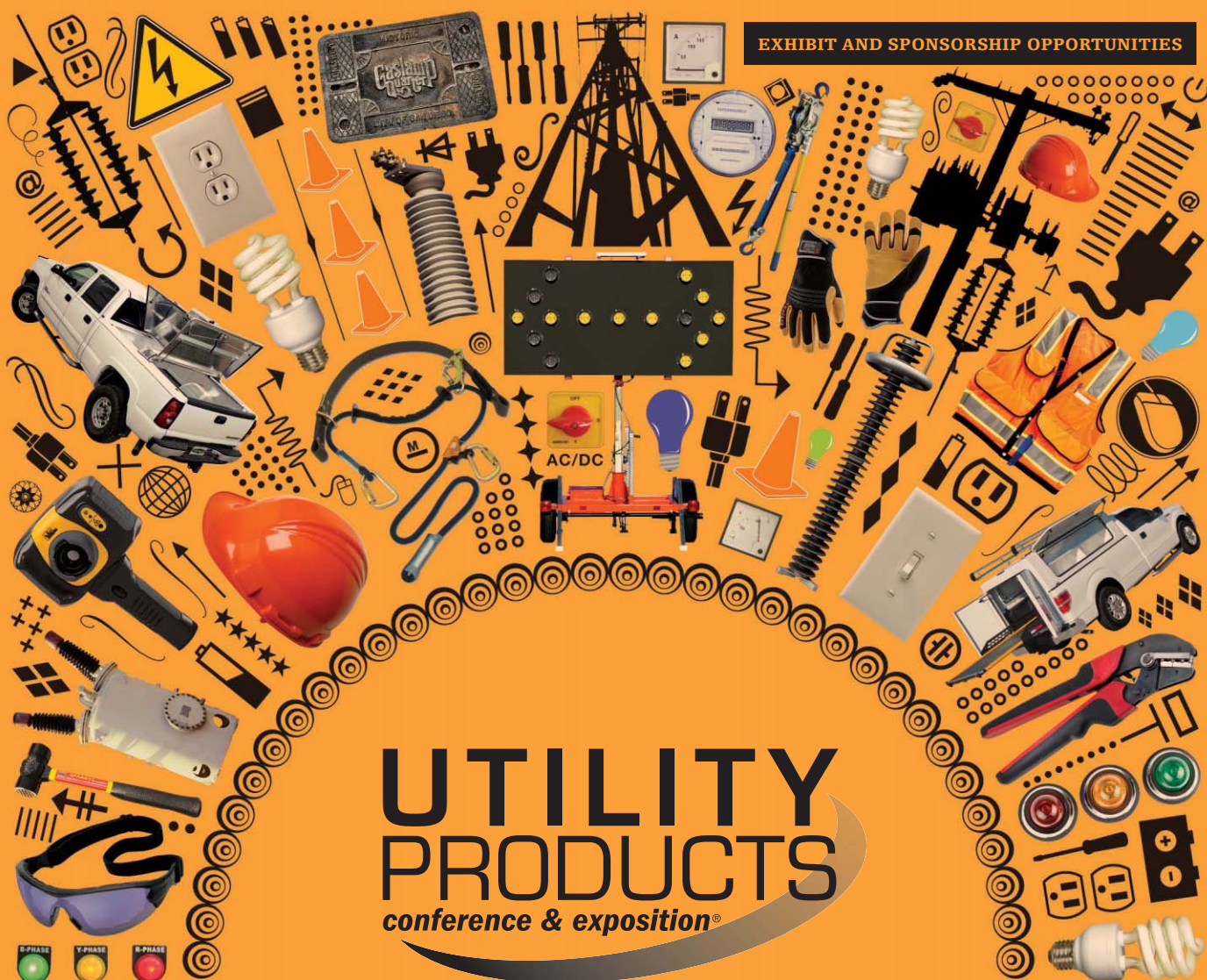
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## •WindFarmConstruction&Maintenance

# Reliable, Long-life Power Cable Crucial to Wind Energy Systems

By S. Ram Ramachandran

**T**he Global Wind Energy Council (GWEC) recently reported 22 percent growth in installed wind energy capacity worldwide during 2010. This represented a \$65 billion investment in supporting equipment and power distribution infrastructure.

To protect this investment, the balance between total system cost and long-term system reliability is crucial. If a wind farm developer, independent power provider or utility specifies quality cables made with the best materials technology and manufactured with exacting standards, the installation can provide decades-long reliability with little to no downtime for electrical losses and expensive repairs. When it comes to satisfying the demand for uninterrupted power by ensuring system reliability, power cable design and construction with validated performance-based materials is critical.

### A Little History

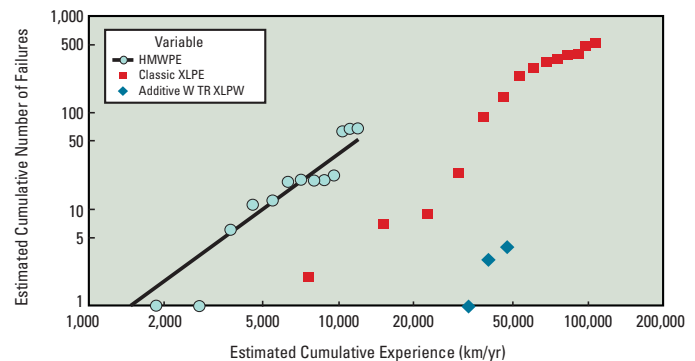
As commercial wind farms have grown as viable alternative energy resources during the past 20 years, cross-linked polyethylene (XLPE) has been recognized as the choice material for medium-voltage power cable construction. Its popularity for direct-buried and submarine cable is predicated on quality, competitiveness and reduced long-term operating costs.

As demonstrated in traditional power distribution networks (see Figure 1), however, XLPE, although superior to materials such as high-molecular-weight polyethylene (HMWPE), has seen its share of performance issues. That led to the development of water-tree retardant XLPE or TR-XLPE insulation for underground (UG) power cables. The cables that move power from wind turbines to the grid—on-shore or off—are subject to the same mechanical and environmental stresses as those experienced in the grid. Conventional wisdom dictates that TR-XLPE becomes the choice material for wind farm 35kV UG power distribution cables.

### Quality Materials Matter

An essential part of long cable life and system reliability is using quality, raw materials tested to perform according to industry specifications. Cable manufacturers look for materials that deliver easy processing while producing the performance attributes end users expect. Flexibility, stress-crack resistance and shield strippability are considerations for easy installation. Once in the ground, cables are subject to environmental stresses including water intrusion and extreme temperature variations. Corrosion kills cables and interrupts power supply. It becomes increasingly important for cable manufacturers, wind farm developers, installers, utilities and others in the value chain to understand the benefits quality materials bring to power cable design and construction.

For many years, cable has been seen as a commodity. The general feeling is that any standard utility cable will operate fine in any



As seen in "Long-life XLPE-insulated Power Cables" edited by Harry Orton, of Orton Consulting Engineers International, and Rick Hartlein, of National Electrical Energy Testing Research and Application Center (NEETRAC)

Figure 1. Failure data for three generations of UG MV cable installed at TXU (ONCOR) in Texas.

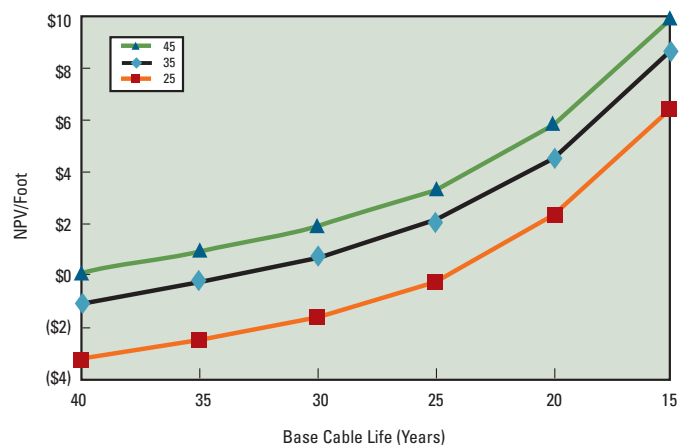


Figure 2. Life Cycle Net Present Value (NPV) comparison example performance cable vs. base cable.

system. Because of this commodity mindset, cable often is purchased based on price rather than its being a critical part of an overall system investment. Shouldn't the cable specified have a lifespan equal to the system it supports? This is possible with performance cable such as TR-XLPE vs. base cable using standard XLPE (see Figure 2). As a case in point, Dow Wire & Cable introduced its DOW Endurance MV 4202 TR-XLPE in 1983. Studies show that nearly 30 years later, buried cable made with this material exhibits little to no wear and has an expected lifespan of more than 40 years.

### Technology, Standards

Many raw materials suppliers and cable makers serve the wind energy market. Research and development at the front end of the



supply chain is important. Cable makers, developers, IPPs and utilities should ask about the kind of technology, clean manufacturing and packaging techniques, testing and validation that goes into raw material production. Similarly, end users should insist on specifying cable that has gone through rigorous testing and meets at least the current minimum performance standards set by utilities. Trusting investment dollars to anything less is risky.

Many testing institutes work with companies and their customers to ensure that raw materials and the cables produced with those materials meet recognized national and international standards. These organizations include: National Electric Energy Testing Research and Applications Center (NEETRAC), standards development agencies such as the Association of Edison Illuminating Companies (AEIC), Insulated Cable Engineers Association (ICEA) and Cable Technology Laboratories (CTL).

In addition, cable makers are producing cables that consistently exceed stringent,

long-term testing standards such as AWTT and ACLT in North America, VDE Standards in Germany and DL/T-1070-2007 in China. These long-term testing methodologies demonstrate a proven record of ensuring long-life, reliable cable performance.

No exclusive standards exist for cable performance in the wind energy market. End users must insist on cables that meet, or preferably exceed, the current power industry minimum standards. Cables form a small percentage of the total power system cost, and polymeric materials represent an even smaller percentage. The renewable energy industry must take a broad view to focus on the needed system reliability that rests largely on excellent materials, quality cable-manufacturing processes and elevated performance standards.

### Improvements at Utilities

Utilities also are implementing practices that include cable inspection, installation and operations. Wisconsin Public Service (WPS) serves more than 400,000 electric

customers in an 11,000-square-mile area. As discussed in a joint white paper authored by WPS and Dow Wire & Cable, the utility has focused on cable reliability for 30 years as a preventive action to delay cable replacement. Cable reliability is determined by WPS based on strict material specifications, a comprehensive plan that monitors incoming cable quality based on those specifications, and in training cable installers. It all leads to effective system management.

Similarly, as a way to provide mutual value and insight, many utilities conduct and share field aging evaluations that provide to materials suppliers and cable manufacturers a broader view of cable and system performance vs. depending solely on accelerated aging tests in a lab. A joint evaluation conducted by Alabama Power and NEETRAC confirm the robustness of TR-XLPE cables made and installed in 1985 (see Figure 3). Results indicate that cable life in excess of 40 years easily can be projected.



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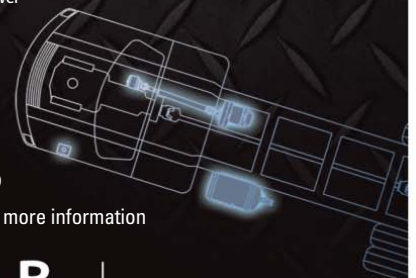


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## Reliable, Long-life...

### It's Time to Work Together

For anything worth pursuing, it takes a community of likeminded people to achieve success. Wind power is not new; however, to go from the power needed to turn a millstone to the power needed to light up and connect communities efficiently and cost-effectively is another story. Collaboration is essential. AWEA and GWEC are helping as they provide gathering places and information portals for all stakeholders. But collaboration must exist in the trenches, as well, among investors, developers, IPPs, utilities, equipment, cable and material suppliers, etc., to realize the energy goals that are legislated or soon will be.

Companies and their customers are working together to develop, validate and adopt superior products for cable construction and to enhance market awareness about building power systems with the right components used best to ensure optimum results for the entire value chain.

And, at a fair price that recognizes the total system cost, including the potential to

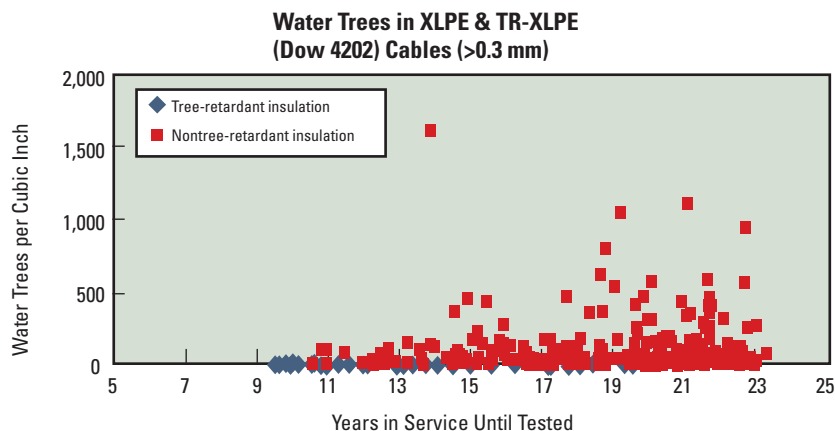


Figure 3. Proven field performance Wisconsin Public Service-Historical Cable Data.

specify quality cable once rather than the additional expense of repair and replacement over the system's lifetime. □

*about the author:*

*S. Ram Ramachandran is global director of end-use marketing for Dow Wire & Cable, a business unit of The Dow Chemical Co. Ram and his team interface with global end users such as utilities, communications groups,*

*off-shore drillers and regulatory boards. He is a Senior Member of the Institute of Electrical and Electronic Engineers (IEEE) and is chairman of the Power Cable Standards Discussion Group of IEEE/Insulated Conductors Committee. He has eight patents and is the author of more than 20 papers.*

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## •Computers&Software



# When a Computer Must Stand Up to Today's Harshest Environments

*A broken promise about the capabilities and worthiness of a computer with critical data, being used miles from the nearest office, can lead to massive problems.*

Many years ago, an overnight-delivery company promoted itself with a clever line touting its overnight service. The slogan implied the guarantee that one's important package would be delivered anyplace in the country the next day. It was a strong statement that made for a successful campaign.

Now, nearly 30 years later, companies in the utilities industry face a problem that can be likened to the urgency of a company needing a package delivered to some distant location overnight. How do they protect critical data on their computers being used in the field—miles from the nearest office and at times in harsh environments?

In other words, how do they know their computer will stand up to the abuse that, in all likelihood, it will encounter today, tomorrow and probably every other day it is used in some type of harsh environment?

One company that has met the challenge is GammaTech Computer Corp. For more than two decades it has designed, manufactured and sold both fully rugged and rugged, hardened notebook and tablet computers that have endured the elements in all manner of applications.

A recent example of the type of fully rugged convertible computer it produces is the Durabook R13C. It passes the Military Standard 810G certification for drop, shock and spill protection as well as demanding standards for explosive atmospheres, salt,





fog, and freeze and thaw. It is suited for a variety of applications, including field service and mobile workers in any type of outdoor environment.

The R13C's IP65 rating ensures all enclosed portions of the unit are completely protected. There is no entryway for dust, and water projected against the unit from any direction has no harmful effects. The R13C features a magnesium-alloy case that is 20 times stronger than the acrylonitrile butadiene styrene (ABS) plastic used in other notebook products—protecting it from jarring, bouncing or dropping.

Making it all work is an Intel Core Low Power i7-620LM vPro processor. It runs on Microsoft Windows 7 Professional, XP Tablet PC Edition and Vista Business operating systems. And, for long days in the field, up to 8GB of system memory can be installed.

***The Durabook R13C  
fully rugged convertible  
computer passes  
Military Standard 810G  
certification for drop,  
shock and spill protection.***

Working in the field can mean bright sunlight or, conversely, little light. It performs night or day because of a water-resistant backlit keyboard and a 13.3-inch, multi-touch, shock-mounted, 1000 NIT LCD sunlight-readable screen.

Users don't have to worry about being connected to civilization, no matter where the job takes them. The R13C offers many integrated communication devices. Connectivity is always possible with its WWAN (3G), WLAN, and Bluetooth 2.1 with enhanced data rate. The unit includes a built-in global positioning system (GPS) receiver to put them in touch with their favorite GPS navigation software. In addition, a pivot hinge allows the R13C to quickly and easily transform into a tablet.

The unit supports multiple security options that assure the integrity of critical information. Unauthorized usage or loss of data is prevented with built-in security features such as a fingerprint scanner, Trusted Platform Module (TPM) 1.2, Smart Card reader and a Kensington lock. □

*About GammaTech Computer Corp.:  
GammaTech Computer Corp.  
designs, manufactures and sells cost-effective, high-performance mobile computing solutions throughout North America. Its line of rugged and hardened notebook and tablet computers are designed and built-to-*

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## •Computers&Software



# Tablet Personal Computers Help Company Realize up to 75 Percent in Time Savings

Norris Public Power District provides wholesale and retail electric service to 44 communities in five counties across southeast Nebraska. Dedicated to providing its 18,000 customers with safe, reliable and affordable energy service, the non-profit, publicly-owned company strives to keep rates low while providing the highest quality service, which enables customers to achieve their business and personal goals.

### Challenge: A Paper-based Process in Need of Updating

The majority of Norris Public Power District's 77 employees are linemen who spend the entire day in the field completing their assigned work, which includes constructing new facilities; addressing necessary upgrades and repairs; performing maintenance work; reading, repairing and exchanging meters; as well as performing meter cutoffs and disabling service. The linemen were previously equipped with paper-based service orders, which contained all pertinent job information. Each morning, the linemen gathered the service orders for the day and, with stacks of papers in hand, spent the day performing their assigned tasks and filling in paperwork by hand. The linemen would return the service orders the next day to one of the company's five offices, where customer service representatives (CSRs) would manually upload the information into the database.

"With any paper-based process—especially with the amount of paper we had moving in and out of the offices—comes an increase in the potential for something to go wrong, such as forms being misplaced or lost and the possibility of not being able to read a lineman's handwriting," said Ryan Krupicka, manager of Consumer and Business Information Systems, Norris Public Power District. "We also had to deal with storing an ever-increasing amount of paperwork, which took up valuable space."

On more than one occasion, Norris Public Power District had to send a lineman out twice for the same job because the paperwork was illegible or misplaced in the office or by the lineman. The company also faced communication issues between its CSRs and linemen when disabling service for customer disconnections.

"In a few instances, customers were unnecessarily disconnected because the CSRs weren't able to update the linemen in time when customer payments were made during the day, meaning some service orders became outdated after the linemen were already out in the field for the day," Krupicka said.

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### Solution: The Motion J3500 Tablet Personal Computer

With its entire meter service depending on the paper-based process, Norris Public Power District knew it needed an upgrade to provide the highest quality service possible. The company began looking at rugged laptops, but found the design to be too heavy and cumbersome for field use. After expanding the search to include tablets, Norris Public Power District came across the Motion J3500 Tablet personal computer (PC) and found what it was looking for—a Windows-based tablet that was compatible and powerful enough to run its software, while still lightweight enough to carry and use while mobile.

"The linemen are outside in all types of weather and needed a device that could stand up to rain, snow, dust, wind as well as being dropped and banged, and we haven't had one maintenance issue yet," Krupicka said. "The display is the best we've ever seen, helping the linemen read the tablet clearly, even in direct sunlight."

When not in use, the tablets are docked and charged in RAM Mounts' J-Series Locking Mobile Docks, mounted in the trucks.

### Results: A New, Automated Workflow Helps Create up to 75 Percent Time Savings

Now, instead of carrying around stacks of service orders, a portion of the linemen rely on the J3500 Tablet PCs to provide them with real-time access to their schedules, service orders and business-critical information—as well as the ability to process meter readings and update the database from the field. In addition, if a new service order comes in during the day, a CSR can assign it in real time based on a lineman's location, which is pulled from the software's integrated global positioning system (GPS) functionality. In the future, the company intends to purchase additional tablets so most of the linemen can reap the same benefit of real-time access to information.

"Once the linemen leave the office in the morning, they are typically in the field for the entire day and previously could only work on the service orders in their hands," Krupicka said. "With the paper-based process, the linemen would not come back to the office to get more service orders to work on, and any new ones had to be processed the next day. Now, the CSRs can assign service orders as they come in, updating the linemen with the tablet while they are in the field."

With the real-time access, a service order that previously took three or four days can now be completed in a single day. In addition, the company no longer worries about unnecessarily disabling a customer's power because the CSRs can update or delete a service order in real time, which automatically notifies the linemen with the tablet.

"That time savings means we can increase the number of customers we service on a daily basis and provide more efficient, accurate service in general, which means enhanced customer service," Krupicka said.

Not only is Norris Public Power District saving costs on the reduction of paper and printing, but increased efficiency means the company is saving the employee hours it takes to shuffle papers between the CSRs and linemen, complete a service order or rectify a mistake.

"With the Motion Tablet PCs, the linemen don't have to worry about entering incorrect data since the system won't let them, paperwork isn't lost or misplaced by office personnel or the linemen, and, since all the information entered on the tablet is converted to legible text, we no longer have any issues reading handwriting," Krupicka said. "This means we don't have to send a lineman back into the field to fix an error or double check information, which means we're saving fuel costs for the trucks and the cost of additional employee hours."

Instead of simply completing their assigned tasks, the linemen are now equipped with the tools to diagnose a potential problem and are able to make any necessary changes on the spot. This alleviates additional trips to the same location for work that could have been done on the first trip. If a problem with a tablet does arise in the field, it can be remotely accessed and questions answered in real time.

### Conclusion: Incorporating Integrated Features for Increased Use Cases

Looking to the future, Norris Public Power District plans to use the J3500 Tablet PC's integrated camera for enhanced documentation when addressing meter tampering issues. The company also plans to incorporate its outage management system with the tablets. During a storm, for example, Norris Public Power District will be able to alert the linemen in real time with the tablets when customers experience power outages, where the outages are occurring and when power has been restored. The company will be able to more efficiently manage the linemen and restore power to its customers sooner.

"What it comes down to for us is being able to enhance our customer service and increase our efficiency, and the J3500 Tablet PCs help us do just that," Krupicka said. "The tablets streamline our entire workflow, from the office to the field and back again, reducing errors, increasing productivity and saving time and costs." □


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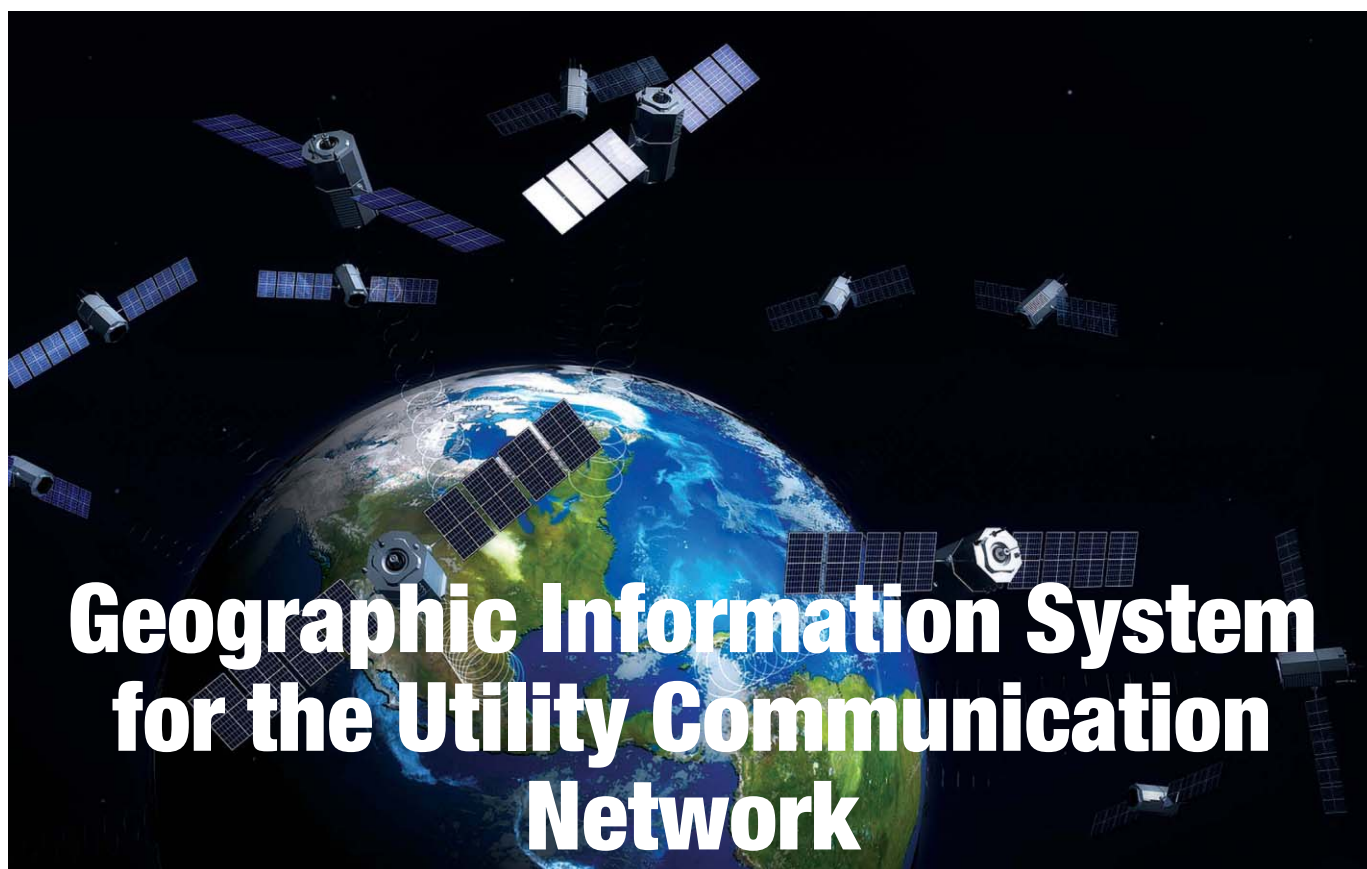


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## •Computers&amp;Software



# Geographic Information System for the Utility Communication Network

By Danny Petrecca

**T**he utility industry is changing at a rapid pace. The expansion of the smart grid is a game changer that requires utilities to operate, maintain and manage advanced two-way communication networks to support real-time data exchange. In addition, utilities have begun considering taking on roles as potential service-providers in the triple-play market, depending on their ability to leverage and expand existing infrastructure to offer fiber-to-the-home (FTTH) services. As these trends push utilities to develop and expand their broadband communications networks, they can learn from the experience of telecommunication service providers. In a highly competitive market environment driven by increased demand for broadband connectivity, these companies have successfully been using enterprise geographic information systems (Enterprise GIS) as a centralized way of managing, updating and analyzing their communications network.

The telecomm industry realized early that to stay ahead of the curve, companies

whose businesses are built on today's optic communication network cannot afford to manage it with yesterday's tools. As utilities enter this market, however, many still document their network with file-based technology, storing critical information in several formats such as computer-aided design (CAD) drawings, spreadsheets and Visio diagrams, or sometimes relying on human memory. With such disparate data management processes and disconnected workflows spread throughout their organization, utilities often don't have a holistic view of their network and, therefore, are unable to share their data internally to support the rest of their business.

In addition, the lack of a complete centralized communications network management system has significant implications for maintenance work in the field, where the crew is at risk of causing inadvertent outages and communication failures as a result of out-of-date or inaccurate information. This is why communication network operators are increasingly looking for solutions to enhance crew confidence in their

assigned tasks, making maintenance operations more efficient and secure.

As a result of these drivers, the Enterprise GIS market has quickly grown. When looking for a solution and choosing among multiple vendors, it is important to know all the potential benefits such an application can yield and which features are critical for fiber optics management software.

## Essential Functions and Features of Enterprise GIS for Utilities

By definition, an Enterprise GIS spans the entire organization. This has two important implications. First, the technology must be able to support a complete enterprise deployment. Systems not fully positioned to work at the enterprise level will perform only part of the job. Second, the organization must be willing to adopt an enterprise mindset across business processes and work flows, making GIS central to all business operations. Establishing these features make Enterprise GIS a powerful tool, providing a centralized database and repository of knowledge



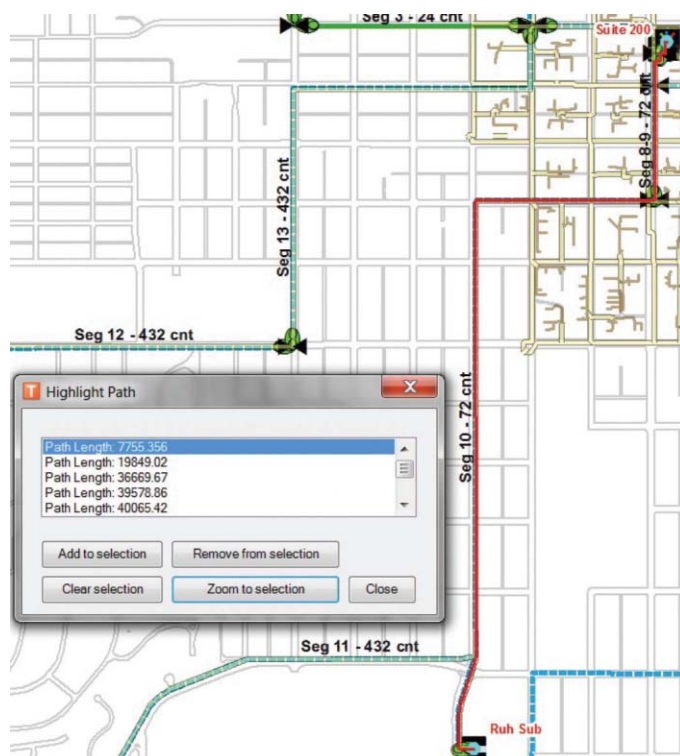
across the enterprise, and allows a utility to manage the entire communications network for four key functions: data maintenance, analysis and reporting; planning and engineering; decision support; and operational awareness.

- An Enterprise GIS offers asset management. Through data maintenance, analysis and reporting, it provides a centralized repository for asset information and network inventory, called a Geodatabase.
- It serves planning and engineering purposes by transforming data into actionable information, such as getting material cost estimates for extending the communications network or setting up new network connectivity based on a new smart grid driver, for example.
- An Enterprise GIS helps utilities get asset management, planning and engineering information into the field, as well as from it, for a complete overview of the system. This offers field crews mobile support, allows them to run reports and traces, as well as obtain answers to questions the crew might have while performing their assigned task.
- An Enterprise GIS has a supporting role in heightening operational awareness across all levels of the organization, disseminating knowledge when and where it is needed.

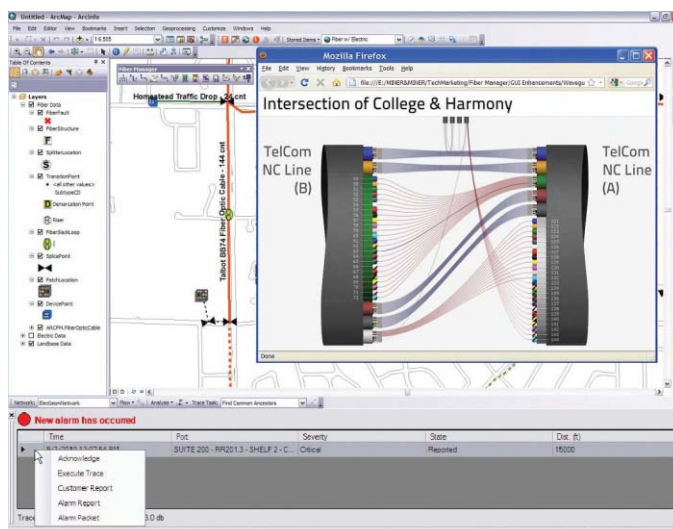
## Productivity Tools Replace Yesterday's Ways of Monitoring the Network

To fulfill these functions, several tools are available that work together to accurately document and assess the location and connectivity of networks.

- For managing connections, communications network operators



Enterprise GIS provides a detailed visual layout of the Geodatabase, showing users an accurate schematic of their asset information and network inventory.



Alarms notify users of issues with the network and the location problem areas with a high degree of accuracy, allowing users to quickly respond to service outages.

need a tool that simplifies entering, updating and understanding the connectivity of a network. When the need to manage certain network fiber paths as a single unit arises, circuit managing tools establish a named communication path from one part of the network to another.

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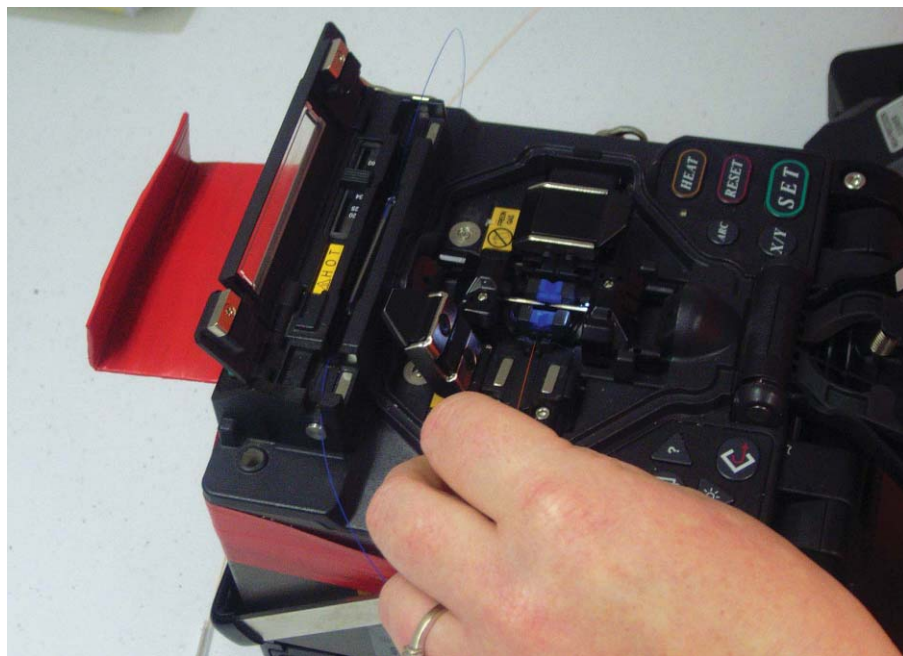
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## Geographic Information...



A fiber technician splicing fibers. Enterprise GIS helps users manage fiber pathways by establishing named circuits that include elements such as splices, fibers and ports.

- When problems with the communications network arise, an Optical Time Domain Reflectometer (OTDR) outage trace can precisely determine the location of a fault or other potential issues in the communications network, allowing faster crew dispatch and restoring the network in the shortest possible time.
- Editing proficiency tools enable utilities to quickly reconfigure patch panels, equipment and racks at a network location, or expand their communications network. It is also useful to analyze data with a comprehensive reporting tool, documenting the connectivity within splice enclosures, patch panels and circuits, as well as available system capacity. With the click of mouse, a reporting tool issues splice reports, splice schematics, patch panel reports, connectivity reports, circuit reports and OTDR trace reports, saving staff time and resources.

### Friendly, Flexible, Future-proof

Productivity tools are only useful when coupled with a high level of user-friendliness and flexibility to changing demand and market conditions. Whether managing a fiber optic network from a central office or planning a future system expansion, network operators need the most accurate information available, mapped out in a user-friendly way to mirror the physical

network. It is crucial to be able to access this information from anywhere—from the field, the desktop or the boardroom. Equally important, systems that allow multiple editors enable them to make updates simultaneously and share data and workflows across the organization.

Because the technologies that drive a network rapidly change, an Enterprise GIS needs a high degree of flexibility and must be future-proof to protect a utility's investment. When systems are highly configurable and customizable to the utility's individual needs, they seamlessly integrate with other business systems while reducing total cost of ownership and maintenance. Almost any level of customization becomes possible when the system is built on open architecture and information technology (IT) standards, and when it is accompanied by a comprehensive support service.

### Enterprise GIS in Practice: Truckee Donner Public Utility District

Utilities worldwide are choosing Enterprise GIS solutions, which are available from multiple vendors, for their communications network design and asset management technology. Among them is the Truckee Donner Public Utility District (PUD), providing electric and water service to 24,000 customers in the Truckee, Calif.

area. The utility needed to improve existing infrastructure and prepare for new smart grid and supervisory control and data acquisition (SCADA) infrastructure. To avoid the high costs associated with poor fiber optic design, Truckee Donner PUD needed to accurately design and model an advanced fiber optic system using its existing GIS infrastructure.

With the help of a GIS Enterprise system—in this case, Telvent's ArcFM Fiber Manager Enterprise GIS solution—Truckee Donner almost immediately experienced improved efficiencies and cost savings. Beginning with the design and planning stages, Truckee Donner accurately determined all needed materials for the project—from cable footage to the number of required splices for each splice box. When Truckee Donner bid the project, it already had an understanding of what materials were required to build the system and how much it was going to cost.

"Fiber Manager not only made our life a lot easier, it's also made our contractor's life that much easier," said Ian Fitzgerald, IT/GIS operations manager at Truckee Donner. "From the beginning, we were able to present the contractor with a well-organized plan, complete with map layouts and splice diagrams. Our contractor has dealt with hundreds of utilities building fiber optic networks, and said this was the first time they've seen a utility as organized and informed as Truckee Donner."

Utilities can yield many benefits by staying current with forward-thinking peers such as Truckee Donner and choosing an Enterprise GIS that best fits their needs. In doing so, utilities can leverage the experience by applying Enterprise GIS in other industries, such as the telecommunications sector, to meet the increased demand for more accurate, efficient and advanced technologies. □

#### About the author:

*Danny Petrecca is currently director of product management for Enterprise GIS at Telvent. He has knowledge and experience with the application of GIS technology to utility and communications industry business needs. His specialty is graphic work design in utilities. Petrecca has 13 years experience in the geospatial industry, and 10 of those years have been with Telvent.*

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# SL-CB Battery-powered Cable Bender for Electrical Utility Industry

Huskie Tools has introduced the SL-CB battery-powered cable bender for the electrical utility industry. The SL-CB uses the pull-pin design, allowing technicians to change jaws from compression to cutting to cable bending. The SL-CB is cited to be just one of the many ergonomic solutions provided by Huskie Tools to help reduce strains and sprains associated with the daily tasks of a powerline technician.

The SL-CB has several different settings, so the tool can be used on either secondary or primary conductor in a variety of sizes. Featuring a low profile, the SL-CB can be used in a variety of close-quarter environments—such as underground vaults, meter bases and substation applications, and wherever cable bending is required. Note: Contact cable manufacturer for specified cable bending radii and cable bending requirements.



## Huskie Tools

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For additional information, contact Will Tomkinson, Sales Manager at 604-422-2613 or [will.tomkinson@xantrex.com](mailto:will.tomkinson@xantrex.com).

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go to <http://utilityproducts.hotims.com/> for more information

## •New**PRODUCTS**Showcase

### Fast-poll, Multi-point, Leased Line Modem for Utility Applications

Synxcom introduces its newest fast-poll, industrial grade, leased line modem—the SM19202FP. The high-performance, point-to-point and multi-point modem offers a training time of 17.5 ms (RTS-CTS delay) over voice-band Telco leased line or private line circuits.

The multi-speed SM19202FP modem series is now offered in desk-top, DIN rail mounting and rack-mount configurations. The SM19202FP is especially useful for industrial communication applications including supervisory control and data acquisition (SCADA) systems, remote terminal units (RTUs), traffic monitoring and control, and industrial automation networks. The modem supports RTUs with EIA RS-232 and RS-485 interface at speeds of 19,200, 9,600, 4,800, 2,400, and 0-1,800 bps. The SM19202FP fast-poll modem operates over four-wire full-duplex or two-wire half-duplex unconditioned lines or private circuits. The modem is housed in a metal enclosure and operates between -40F to +185F.

**Synxcom Inc.**

**CIRCLE 112 ON READER SERVICE CARD**



### Grundodril 4X Drill is Compact and Less Intrusive

TT Technologies' compact Grundodril 4X is designed for residential service, small diameter main installations, last mile operations and gas pipeline applications—offering 9,800 lbs of thrust and pull-back. Using the compact drill is less intrusive and useful for areas where larger units are not an option.

The drill features a dual hydrostatic pump system and a four-auger stake down system that provides greater stability. The Grundodril 4X also comes with the Smart Vice system that automatically performs vice cycling operations.

**TT Technologies Inc.**

**CIRCLE 113 ON READER SERVICE CARD**

### Mini-Blower/Pusher is Portable Solution for Installing Micro Fiber and Traditional Fiber Optic Cable

The new Mini-Blower/Pusher from Condux is a lightweight, portable solution for the installation of micro fiber and traditional fiber optic cable. The compact unit is designed for difficult job sites and "last mile" fiber installations. The unit's updated design has made operation easier, allowing the user to drive the system with a cordless, corded or pneumatic drill. The universal stem provides for right side and left side connections for forward drive and reverse drive.

The Mini-Blower/Pusher's machined aluminum construction provides a lightweight profile with long life and durability. The unit can install fiber optic cables with diameters from 0.23 inch to 0.50 inch into micro duct, 0.3937 inch to 0.7087 inch, or traditional duct from 0.50 inch to 1.5 inch. The unit can be further configured to push/install duct rod into conduit and inner duct.

**Condux**

**CIRCLE 114 ON READER SERVICE CARD**



### Model C100S Rotary Wire Stripper and Twister Provides Quick, Clean Strip

Eraser's Model C100S Rotary Wire Stripper and Twister will process insulations from solid and stranded wires such as Teflon, P.T.F.E., PVC, Nylon, KEL-F and many more. Strip length and blade depth adjustments are easily made while the machine is running. The C100S will remove the insulation while twisting the stranded conductors at the same time. With the strip length stop, the C100S can strip lengths from 3/16 inch up to 1 1/2 inch, depending on the material, and can strip wire from 0.031 inch up to 0.228 inch in diameter measuring over the insulation.

The Eraser Co. Inc. manufactures a wide range of industrial products including wire, cable and tubing cutters, wire and cable strippers, wire twisters, wire brush wheels, dereelers, infrared heating equipment, measuring tools and FybRglass erasers. The company is ISO 9001:2008 certified.

**The Eraser Co. Inc.**

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## NightRay Spotlight: Vehicle-mounted Spotlight is Brighter and Competitively Priced

KH Industries' vehicle-mounted NightRay spotlights now have the option of a 360,000-cp spotlight-only bulb. The Par 46 H3 Halogen spot-only bulbs are extremely bright, provide hundreds of hours of run time and cost 50 percent less than dual filament bulbs.

The NightRay spot-only has the durability of the traditional dual-filament NightRay spotlights, but with a much brighter bulb. Last year, the company introduced its HID NightRay, which is cited to be the brightest vehicle-mounted spotlight in the utility industry. Not all customers, however, require the intensity of HID or could afford the price tag.

The Par 46 H3 Halogen spot-only is an affordable solution for nighttime inspection and repair professionals who are looking for a bright spotlight that is designed for the rigors of the utility industry. All NightRay spotlights are designed for use in extreme weather conditions, including snow, ice and saltwater. Models include:

- 775-20: Hardwired NightRay, Par 46 H1 spotlight only—dash-mounted control panel and wiring harness;
- NR-775-20KFDS: Wireless NightRay, Par 46 H1 s transformer and light system potlight only, with key-fob; and
- NR-775-20DDC: Dual Controlled NightRay, Par 46 H1 spotlight only—dash-mounted control panel, wiring harness and key-fob.

**KH Industries**

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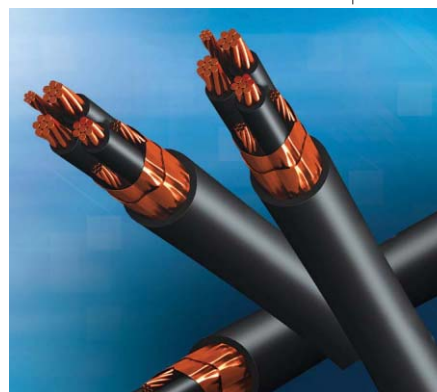
## Variable Frequency Drive Cable Provides Economical Cabling

Belden Inc., a signal transmission solutions company for mission-critical applications, announces its new Canadian Standards Association (CSA) Tray-rated Variable Frequency Drive (VFD) cable. Conforming to CSA requirements, the VFD cable is an economical but robust solution for motor-to-drive connections, noise sensitive applications requiring shielded power cable, and other solid state power supplies with variable frequency needs.

Belden's CSA Tray-rated VFD cable decreases the effects of common mode current containment (CMC), capacitive coupling and reflected wave voltage, and is proven to outperform other types of cabling used for VFD including unshielded cables and other constructions that are susceptible to noise emissions, high-frequency impedance or capacitance coupling.

**Belden Inc.**

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## Electrical Safe Work Practices

All persons who install, maintain, repair or work near electrical power equipment need electrical safety training. United States labor law spells out safe work practices and employee training requirements. New Standard Institute's computer-based training provides the information required by the Occupational Safety and Health Administration (OSHA) 29CFR1910 Subpart S, as well as other important safety information not required by OSHA.

Topics covered in this training include:

- US OSHA law and other electrical safety standards;
- Unsafe conditions vs. unsafe acts;
- Effects of electric shock;
- Arc flash hazards, protection and compliance;
- Energized equipment;
- Safe work practices; and
- Use of equipment and more.

**New Standard Institute**

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## •New **PRODUCTS** Showcase

### New 14-ton DX140LCR Crawler Excavator Features Reduced Tail Swing for Tight Quarters

Reduced tail swing on the new Doosan DX140LCR crawler excavator makes it especially useful for working on roadways, railroad rights of way and in other tight quarters. The tail swing radius on the 14-ton DX140LCR is 4 feet, 10 inches, which allows it to work on congested jobsites such as streets, highways and rail lines without blocking traffic in adjacent lanes or tracks. Reduced tail swing also minimizes the potential for damage when working close to buildings or walls.

At the same time, the 12-foot-4-inch track length on the DX-140LCR provides high stability for digging and lifting operations. An optional dozer blade further increases the machine's lifting capacity.

The DX140LCR is powered by a 108-hp, Tier 3 compliant Cummins diesel engine. It has an operating weight of 32,408 pounds with standard boom, arm and 0.51 cubic yard bucket.

Bucket breakout force is 23,149 pounds with the standard 9-foot-10-inch arm. Arm breakout force is 12,566 pounds. Lifting capacity over front at a 15-foot radius is 11,140 pounds and drawbar pull is 27,558 pounds.

**Doosan**

**CIRCLE 119 ON READER SERVICE CARD**



### Retractable Tool Tether Offers Full Range of Motion, Minimizes Entanglement

Gear Keeper's new RT3-5601 retractable tether, for tools up to 2 pounds, is particularly valuable when working in close quarters or climbing. Available in high visibility orange, the retractable tether's ultra low profile keeps tools close to the body when stored—while still allowing complete accessibility in all directions when in use. The tether's patented side-release clip improves productivity while maintaining drop safety by providing a method for easily exchanging one tool for another.

Like other retractables in the Gear Keeper line, the RT3-5601 is engineered so the tool, application and recoil/retraction force are in balance.

When the RT3-5601 retractable tether is extended for use, only minimal force is necessary, thereby avoiding worker fatigue or, in the reverse, causing a kick when the tool is automatically retracted.

The RT3-5601 tether extends up to 42 inches, and, to reduce arm strain, the tether features a ratcheted thumb-controlled device to lock the cable at any extension length. In addition, the Dual-Axis rotation clamp-on clip easily attaches to a tool belt or fall protection harness. Because of the universal movement of the dual action clip, resistance and line wear are minimized and the life of the tether is extended.

**Gear Keeper**

**CIRCLE 120 ON READER SERVICE CARD**



### PUPI Ground Wire Insulator Tubes for Electric Utilities

GEOTEK has added PUPI fiberglass ground wire insulator tubes to its product line for electric utilities. These durable tubes are made of high-performance pultruded fiberglass to provide ground wire isolation and dielectric protection. Protected by SunGUARD, the new ground wire insulator tubes offer the same three levels of ultraviolet (UV) and weathering protection as PUPI tangent and deadend crossarms.

The new ground wire insulator tubes are made to customer requirements and are available in different lengths to adapt to different applications. The company's goal is to offer products that improve the performance and longevity of distribution and transmission systems for its electric utility customers.

**GEOTEK**

**CIRCLE 121 ON READER SERVICE CARD**

### Shark 100B Meter with Native BACnet/IP Protocol

Electro Industries/GaugeTech (EIG) announces the release of its Shark 100B meter with native BACnet/IP protocol. The Shark 100B meter acts as a BACnet server to seamlessly integrate with any BACnet building management system or application.

The latest entry in the Shark series, this meter has been developed for "green" buildings, Leadership in Energy and Environmental Design (LEED) certification and other energy management strategies. The highly accurate Shark 100B meter has a Web interface for remote BACnet/IP and Modbus configuration, and tracking of energy readings through the Internet using any standard Web browser.

**Electro Industries/GaugeTech (EIG)**

**CIRCLE 122 ON READER SERVICE CARD**





## Arc Guard System Provides Enhanced Arc Flash Protection

ABB Low Voltage Products Div. has released TVOC-2, a new generation of its proprietary Arc Guard System that protects electrical equipment from electrical arc flashes. TVOC-2 features numerous upgrades and new functions to provide high arch flash protection, detecting faults in low and medium voltage switchgear and disconnecting the power provided to the arc within 30 to 50 milliseconds—preventing serious injury to personnel and damage to expensive equipment. Without the Arc Guard System, an arc flash will typically trip a circuit breaker in approximately 1 second, enough time for the arc to destroy the switchgear and kill or seriously injure a person.

TVOC-2 is now Underwriters Laboratories (UL) listed, and, when installed with ABB's Emax circuit breakers, carries a functional safety rating of SIL-2 as certified by TÜV Rheinland, an independent global provider of safety analysis. The SIL-2 certification confirms that the TVOC-2 has achieved the standard required to protect both humans and equipment.

**ABB Low Voltage Products Div.**  
**CIRCLE 123 ON READER SERVICE CARD**



## MxVision WeatherSentry Online Wind Energy Edition Lightning Alerting System

Telvent's MxVision WeatherSentry Online Wind Energy Edition warns wind farm operators when lightning strikes are detected within a predefined radius, providing sufficient time for personnel to evacuate before lightning is in their immediate area. The height and locations of wind turbines make them especially prone to lightning strikes, threatening not only crew safety but also operational efficiency.

Telvent's reliable lightning alerting system automatically sends alerts to personnel both in the control room and to crews' cell phones in the field when strikes are detected within a pre-defined radius, giving crews the time needed to evacuate. The accuracy of this technology also helps wind farm managers avoid false alarms and unplanned evacuations because of weather, increasing efficiency and thereby delivering cost savings. Telvent's lightning safety solution is relied on by approximately 60 percent of North American wind farms.

**Telvent**  
**CIRCLE 124 ON READER SERVICE CARD**

## PRX-500 Proximity Voltage Detector

HDE's PRX-500 Proximity Voltage Detector is a non-contact voltage detector with nine selectable voltage ranges from 120 Vac up to 500 kVac. The PRX-500 provides an audible and visual indication of voltage detected from elbow test points up to the highest transmission voltages. The PRX-500 features an easy-to-use electronic touch pad with large buttons and has a rechargeable internal battery that can be quickly charged from your truck or a wall outlet. Features and benefits include:

- Rechargeable battery with quick recharge—if battery is low, a quick 15-minute charge provides over one full day of use;
- Nine standard voltage ranges from 120 Vac up to 500 kVac;
- Detects voltages 10 inches or greater from source and most elbow test points;
- Weighs less than 1 pound;
- Loud beeper and light emitting diode (LED) lights indicate voltage;
- A full charge takes only three hours and gives one week of continuous use;
- Made in the USA; and
- Can be used on 50 Hz and 60 Hz systems.

**HD Electric Co.**  
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## •New **PRODUCTS** Showcase

### Keyless Tool Control Provides Affordable Tool Security for Mobile Boxes

Snap-on Industrial's new Level 5 Keyless Tool Control (KTC) series of tool storage systems fully secure tools by using an electronic keypad or scanning an ID badge to gain tool box entry. The KTC system is for boxes in applications such as fleet garages and more.



It's easy for technicians in this environment to forget or lose track of their toolbox keys. With KTC, the box is easily accessed anytime and anywhere, achieving the same level of security as a lock and key system while eliminating the inconvenience that keys often produce. The result is a tool storage system that enhances shop and facility productivity.

The KTC entry panel is incorporated into the top of the toolbox for easy access. Because it's designed to work best for boxes on the move, the KTC system can be powered by six D-cell batteries (which can last up to six months), or it can be plugged into an ac outlet.

**Snap-on Industrial**  
CIRCLE 126 ON READER SERVICE CARD

### Rechargeable and Portable Hazardous Area Light

The RUL-9 portable hazardous area light from Larson Electronics' [Magnalight.com](http://Magnalight.com) provides high power, durable operation, rechargeable capability and five hours of powerful illumination in a Class 1, Div. 2 approved hazardous location rated package. This portable hazardous location light provides a strong light beam and long run times on a single charge of its lithium-ion batteries.

Equipped with an integral carry handle, rear mounted LEDs and articulating head, this portable light is suited to a wide variety of uses including utility work, industrial applications and emergency services.

Made in the USA and designed to provide a rugged lighting solution for use in demanding hazardous locations, the RUL-9 portable

and rechargeable light produces 120,000 candlepower and can operate for five hours on a single charge of its lithium-ion batteries. Constructed with a high-strength nylon body with rubberized coating, this unit is built to withstand demanding service.

**Larson Electronics, [Magnalight.com](http://Magnalight.com)**  
CIRCLE 128 ON READER SERVICE CARD



### Sinvert Solar Inverters Offer Peak Efficiency

Siemens Industry Inc. introduces its new Sinvert PVM Underwriters Laboratories (UL) inverter, designed for peak efficiency and maximum plant yields to convert solar energy into grid-compliant ac voltage for infeed into conventional power supply networks. The Sinvert PVM UL inverters are available from 12 kW to 24 kW for small to medium sized plants in the commercial market and are capable of delivering more than 98 percent peak efficiency.

With PVM12 UL, PVM16 UL, PVM20 UL and PVM24 UL models, the Sinvert PVM UL inverters are suited for various applications, including commercial office buildings, public spaces such as schools and municipal buildings, roofs of industrial buildings or ground-mounted plants. Capable of outputs for photovoltaic (PV) plants up to the megawatt range, these PVM UL inverters provide a high degree of economic efficiency over the entire life cycle of a grid-connected PV system.

**Siemens Industry Inc.**  
CIRCLE 127 ON READER SERVICE CARD



### NaviTEK II Cable Tester Technician Tool for Frontline Network Testing



IDEAL Industries Networks, the networking technology division of IDEAL Industries Inc., has launched the NaviTEK II—this fast, cost-effective Ethernet service and cable tester for frontline technicians. NaviTEK II includes IPv6, PoE+, VLANs, Trace Route and advanced color liquid-crystal display (LCD) screen to view pin-by-pin wiremap capabilities that are standard in modern network deployments.

The NaviTEK II is an affordable, handheld tester that lets frontline technicians literally see into copper or fiber networks to identify complex connectivity problems and quickly resolve them. It makes troubleshooting local area network (LAN) physical

and network layers more efficient.

Engineered for rapid deployment with a minimal learning curve, the NaviTEK II features a simplified user-interface that allows even inexperienced technicians to quickly get their networks back up and running. One reason is its large LCD; while other manufacturers' testers force technicians to read small letters on 2-inch monochrome screens, the NaviTEK II has a 3.5-inch color LCD with large fonts and an on-screen keyboard to speed data entry of Internet Protocol (IP) addresses and customer information.

**IDEAL Industries Networks**  
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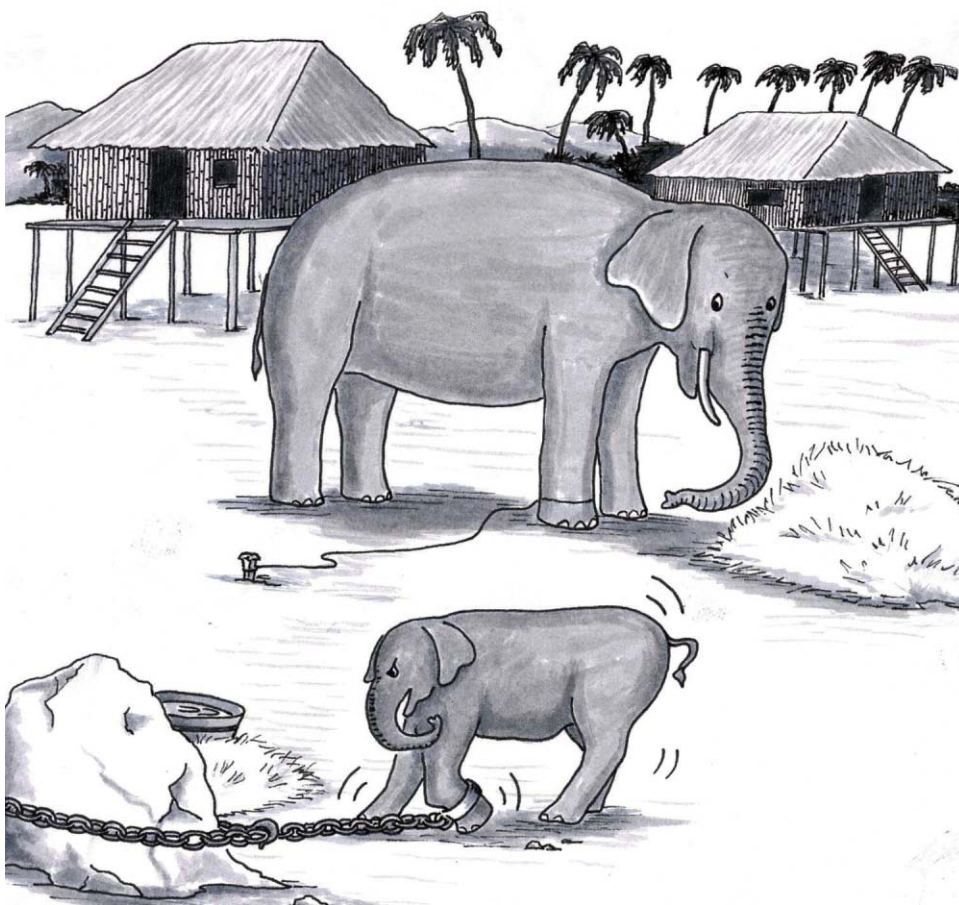
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# Habits are Tough to Break— Learn Well

By Matt Forck

**Y**ou can't hold a good man down, right? True, but what about a good elephant? In India, elephants are still used as they were centuries ago, for labor and for their power. When they are small, about 200 pounds, they are secured with a strong rope or chain to a large tree or other non-moveable object. The small elephant tries to break free. The elephant will pull, tug and chew but, in the end, will give up. The spirit is broken.

From this experience, the elephant learns he cannot free himself—that he is trapped, powerless or limited by this force. It's a moment early in life that a choice is made and a belief planted. The belief leads to truth. The truth tells the elephant the rope or chain will always

hold him down. Despite his best efforts, he can't break free. He believes this truth is the reality of his life.

Now that the elephant's thought has led to belief, then to truth, and has formed his reality, the owner can remove the heavy rope or chain and untie the animal. The owner replaces the large rope or chain with a small one. Then, he can tie the full-grown, four-ton elephant to a small fence or stake. The elephant won't break free—he can't. A belief is a belief, right or wrong.

So, back to the original question—can't hold a good man down, right? Well no, no one can hold a good man down. But, if he doesn't challenge his own beliefs, truths and realities, he will hold himself down—just like the four-ton beast being held securely to the garden stake.

Today in safety, question your beliefs and habits. Make sure they are serving your goal of working today, each task and each choice, safely. □

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*About the Author:*

*Matt Forck, CSP & JLW, is a leading voice in safety. Matt keynotes conferences and consults industry on safety's most urgent topics such as safety awareness, employee engagement and motivation, cultural alignment, accountability and leadership. To learn more about Matt, book a presentation or download FREE safety tools, go to [www.thesafetysoul.org](http://www.thesafetysoul.org).*



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