TRANSACTIONS

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IN THIS ISSUE

TRANSACTIONS is a service of GDS Associates, Inc., a multi-service consulting and engineering firm formed in 1986.

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Electricity Availability Has Been Taken For Granted

Throw a light switch "on" and we expect there to be light.

When it doesn't happen it can be an annoying or even dangerous situation. Fortunately, aside from the occasional burned out light bulb or the even more infrequent power interruption, it doesn't happen often. However, it does point out the fact that we take the availability of electricity for granted most of the time. Strange, given the fact that our country's economic health measured in Gross National Product (GNP) has been directly tied to the use of electricity since the end of World War II. Most people under the age of 70 probably don't remember a time when electricity wasn't available. In 1936 the Rural Electrification Administration was created to help bring electric service to rural areas. Since that time the electric system in the United States has grown to what it is today.

Our appetite continues to grow.

Our appetite for electricity continues to grow. The electric use in my home state of Wisconsin, for example, has been growing at the rate of about 3 percent per year. We continue to find new uses for electricity in our homes, farms, and other businesses. We're building new and significantly larger homes than in the past. Businesses expand and require new and larger space.

As a nation we enjoy the benefits of an expanding economy. However, if we continue at the current pace of increased electric use we will need to double the amount that we're able to produce and distribute within the next 25 years. That may seem like a long time but considering the time necessary to approve, design, build, and begin operating a large power plant or major transmission line those 25 years can go by rather quickly. In addition, simply adding generating capacity will not get the electricity to where it's needed.

Increased electric use means that all of the transmission and distribution lines need to be capable of handling all that power. If not, new or upgraded lines need to be added. Those upgrades do not happen overnight, and they can cost a lot of money.

Many States, including Wisconsin, are making substantial investments in building and upgrading the electric grid. All of these dollars are being spent to ensure that the system generating and delivering power to our homes and businesses is as safe, reliable, and efficient as we've come to expect.

The big three.

Safety, **reliability**, and **efficiency**, whether running a profitable business or buying a car, these three factors weigh-in when making decisions. So, too with the system that generates, transmits, and distributes the electricity that we use in our businesses and homes. While we generally take it for granted when we turn on a light switch we will have light, there is a lot of "hidden" work that goes into making that happen safely, reliably, and efficiently.

Safety first.

First and foremost, safely delivering and using electricity is a joint responsibility for everyone concerned. And there are a lot of folks involved in ensuring that safety. In some states, utility regulators ensure that the electric grid system is designed for safe generation, transmission, and distribution. In Wisconsin, this job rests with the

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Public Service Commission. Three full-time Commissioners, appointed by the Governor for 6-year terms, plus technical and other support staff, make up the "Commission."

Safety for the utilities or cooperatives who are charged with serving their customers means everything from; managing the run-off from a coal pile (environmental safety), to ensuring the safety of their workers (occupational safety), to ensuring that the electric grid is designed, operated, and maintained to safely distribute the power needed for their customers.

Electrical contractors who install the wiring in our homes and businesses then run the wires from the utility meter are also a critical part of ensuring safety. The total number of miles of wire that are installed in Wisconsin, for example, is estimated to be in the millions while the number of individual wire-to-wire and wire-to-equipment connections are likely in the billions. Staggering numbers when you look at the total picture. Electricians trained to install wiring according to the National Electrical Code (NEC) and individual state electrical codes provide the necessary skills to safeguard persons and property while connecting equipment that is powered by the grid.

We as the ultimate users of electricity also need to have a healthy respect for electricity and practice safe use in our homes and businesses. We've all been told numerous times "Don't plug too many appliances into a single electrical outlet," "Don't run extension cords underneath rugs," and "Don't get electrical appliances anywhere near water." These are basic safety rules intended to reduce the potential for personal injury and fire potential to our property. Understanding these rules ourselves and teaching our children to follow them, as well, will ensure that we have the benefits that electricity provides at a minimum risk.

Reliability…a close second.

Setting expectations on how we use electricity, remembering that we often take its availability for granted, has more to do with when it doesn't work than when it does. We all recognize a problem if the light doesn't work when we throw the switch. Maybe we'll notice if we see the lights dim momentarily when a motor or appliance turns "on." And we'll likely notice when the lights "flicker" during a thunderstorm. But the reliability of our total electrical system is not only about "working when we want it to work," but also about "working the way that we want it to work."

"Keep the lights on" or working when we want it to work is itself a complicated process. Keeping the power plants working, making sure that there are adequate number of transmission and distribution lines to bring that power to us, as well as ensuring that our homes and businesses are wired properly all determine whether we have power when we need and want it. Millions of hours have and will be spent designing, installing, operating and maintaining the network that delivers power. A difficult set of tasks, but manageable if you consider that we usually don't have to worry about the lights coming on.

Through regulation, standardization of designs, operation, and maintenance we have a system that works very well almost all of the time. Yes, there are the well-publicized “blackouts” that occasionally occur; however, they are the exceptions and are sometimes started by weather-related events such as thunder-storms, tornadoes, or hurricanes.

"Working the way that we want" means that the power being delivered has the right voltage, the right wave "shape" and doesn't have any other characteristics that can cause problems for equipment. A term for all of this is "power quality." Equipment is designed to standards that require a certain level of power quality. Too much "noise" and some electronic equipment will not operate properly and not enough voltage and some equipment, such as an air conditioner or motor, won't even be able to start.

In our homes and businesses we can use surge suppressors and other devices to prevent damage and protect sensitive electronic equipment like computers, televisions, etc. For the power grid, reliability is built into the system through the use of protective relays, grounding, shielding of equipment, and interconnections that provide multiple pathways for electricity to move. This built-in redundancy helps to protect the entire system by isolating problem areas until crews can be dispatched to correct the problem.

Third, don't forget efficiency!

With all costs continuing to increase, as well as the significant investments in new generation and planned upgrades to the electrical system looming on the horizon, it would be a mistake not to consider efficiency.

Efficiency in the decision process so that valuable time is not wasted…**Efficiency** in the designs for new generating plants… **Efficiency** considerations when we use electricity in our homes and businesses. Efficiency is about choices and to paraphrase a college professor, "Some choices are better than others." There are a host of options for utility regulators, utility industry professionals, contractors, and individuals, as energy consumers, to consider when making decisions.

Our choices should not compromise safety, should consider high levels of reliability, and should be cost-effective. Staying informed and knowing where to get information are keys to making the best choices. Below is a brief list of some national and regional sources of information. Remember to explore your state and local organization as well, such as Focus On Energy, Wisconsin’s state program (www.focusonenergy.com).

Organization	Web site
American Council for an Energy-Efficient Economy	www.aceee.org
Alliance to Save Energy	www.ase.org
Southface Energy Institute	www.southface.org
National Food and Energy Council	www.nfec.org
Northeast Energy Efficiency Partnerships, Inc.	www.neep.org
Midwest Energy Efficiency Alliance	www.mwalliance.org
Southwest Energy Efficiency Project	www.swenergy.org
Northwest Energy Efficiency Alliance	www.nwalliance.org

One final thought.

Keeping the lights on is a shared responsibility. If we want to make sure that the lights turn on when we throw the light switch, we all need to work together to make sure that keeps happening.

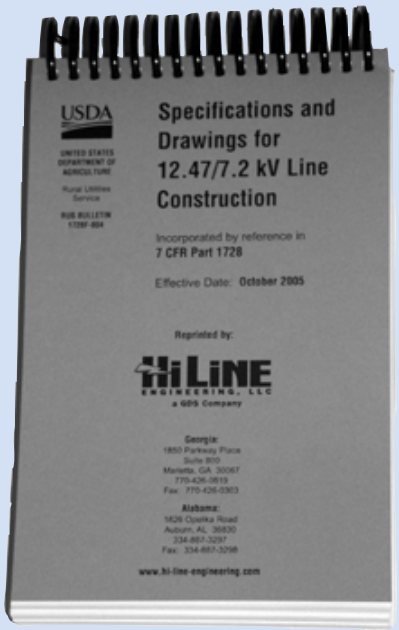
Rich Hackner is Region Manager of GDS's Wisconsin office in Madison and has been in the energy business for over 20 years. He is the current chair of the Rural Energy Management Council, an advisory council that is hosted by the Wisconsin Department of Agriculture, Trade and Consumer Protection. Rich is a licensed P.E. and is currently managing the Wisconsin Focus on Energy's Agriculture and Rural Business Program that has helped over 850 farmers in Wisconsin implement energy saving projects that will save them over $25 million in reduced energy bills over the next several years. For more information, contact Rich at 608-273-0182 or email: rich.hackner@gdsassociates.com

New RUS Specification and Drawings for 12.47/7.2 kV Line Construction Released

The **Rural Utilities Service (RUS)** has now released **Bulletin 1728F-804, Specification and Drawings for 12.47/7.2 kV Line Construction**. The effective date for this bulletin is **October 2005**. The new specification has several new improvements over the older **REA Bulletin 50-3**, including a new assembly numbering scheme incorporating dots instead of dashes for the assembly numbers, which is similar to the updated 25 kV line construction specification released a few years earlier.

It should be noted that borrowers can continue to use the older numbering scheme as long as new construction after October 2005 meets the new assembly specifications. In addition, there are additional narrow profile assemblies included and maximum line angle charts included for reference.

If you are interested in downloading a PDF copy of this new specification, you can do so at our Hi-Line website, **www.hi-line-engineering.com**, or you can purchase our new **"Mini Green Book,"** which is a reduced pocket size, spiral-bound version of the 12.47/7.2 kV line construction specifications, which is also available on our website.



For more information, contact Braxton Underwood at 770-425-0819 or email: braxton.underwood@hi-line-engineering.com

CODE CORNER

The Difference Between the NEC *and* NESC

There are two primary electrical codes used in the United States: the **National Electrical Code (NEC)** and the **National Electrical Safety Code (NESC)**.

The **NEC** is maintained by the National Fire Protection Association with updates every two years. This code can generically be described as applying to the public and private premises including parking lot lights (refer to NEC Article 90.2(A)(2)).

The **NESC** is maintained by a committee of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and is approved by American National Standards Institute (ANSI). This code is updated every 4 to 5 years with the next revision scheduled for 2007. This code generally applies to electric utilities and communication utilities (refer to Section 1 Rule 011.A). The transition point from the NESC to NEC is referred to as the "service point" (refer to NESC Rule 011.B).

The major distinction between the two codes is the style of the codes. The **NESC** is a *performance-based* code while the **NEC** is a *prescriptive-based* code. A *performance-based* code provides rules for how a system should perform, but does not provide details on how to achieve this performance. An example is where the NESC requires 12 kV conductors be 18.5 feet above ground for specified conditions, but it doesn't say how this is to be achieved. The designer can use short poles with short spans or tall poles and long spans, but when the design is complete, it must provide 18.5 feet of clearance above ground for specified conditions.

The **NEC** *prescriptive-based* code does not list performance criteria, rather the code says exactly how a system is to be designed. This achieves the safety objectives contained in Article 90.1(A). An example is the very specific rules concerning the sizing of protective devices, which achieve the safety objective of preventing over-loaded system components. One reason for a prescriptive-based code is that many jurisdictions have no inspections and others have inspectors with no specialized electrical training. Another reason for a prescriptive-based code is that it does not require an advanced engineering degree to design a system; rather, the designer need only adhere to all of the NEC requirements.

This difference in the style of the codes leads to confusion when comparing rules in each of the codes. The NESC method leaves the design decisions to the engineer, who is responsible for complying with the performance standards; whereas, the NEC provides explicit rules for the design, which if followed, achieve the NEC's safety objectives.

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We hope you find our newsletter informative, if you know a colleague that would like to receive a free subscription, just email us their information to
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and we'll make sure they start receiving the next issue.

GDS Associates, Inc.
Engineers and Consultants

Mission Statement:

To help our clients succeed by anticipating and understanding their needs, and by efficiently delivering quality services with confidence and integrity.

GDS Associates, Inc. is a multi-service consulting and engineering firm formed in 1986 and now employs a staff of over 100 in five locations across the U.S. Our broad range of expertise focuses on clients associated with, or affected by, electric, gas, and water utilities. In addition, we offer information technology, market research, and statistical services to a diverse client base. The size and depth of our firm permits us to offer clients multiple sources of assistance, ensuring complete, competent, and timely service. Some of the consulting areas in which GDS has specialized skills are:

1. Power Supply Planning Services
2. Financial Analysis and Rate Services
3. Generation Services
4. Regulatory and Restructuring Services
5. Transmission Services
6. Renewable Energy Resources, Dist. Generation, & CHP
7. Energy Efficiency and Demand-Side Mgmt. Services
8. Risk Management Services
9. Electric Planning and Design Services (Hi-Line Engineering, LLC)
10. Environmental Management Services (GreenLine Environmental)
11. Deregulation and Retail Energy Procurement Services
12. Utility Privatization Services
13. Water and Wastewater Utility Consulting Services
14. Natural Gas Consulting Services
15. Statistics and Market Research Services
16. Information Technology Services

GDS consultants are recognized leaders in their respective fields, dedicated to their clients, innovative in their approach to meeting unique challenges, and known for consistently being available when needed. GDS strives to develop long-term client relationships. Our goal is to be a wise investment in consulting services for our clients.

Hi-Line Engineering, LLC is a wholly owned subsidiary of GDS Associates, Inc. Hi-Line specializes in providing safe, reliable, and efficient planning and design for electric cooperatives, investor owned utilities, municipal electric systems, and the military in all types of terrain and all three NESC loading districts. Hi-Line's areas of expertise include:

1. Overhead Distribution Line Design and Staking
2. Underground Distribution System Design
3. Inspection and Inventory
4. Contract Administration
5. System Planning and Analysis
6. Right-of-Way Vegetation Management
7. GIS/GPS Mapping and Inventory
8. Training Services
9. Specialized Design Services

Hi-Line uses the latest technology to increase efficiency and accuracy. Our commitment to client satisfaction and diversity of expertise ensures that we provide the highest quality of service.

GreenLine Environmental, a division of Hi-Line Engineering, LLC, provides environmental services specially geared to the electric utility industry. GreenLine's staff is composed of registered foresters and ISA certified arborists. Our experience in both power line design and operation complement our expertise in vegetation management on right-of-ways. GreenLine offers the following services to utilities, municipals, developers, industry, and the military:

1. Right-of-Way Vegetation Management
2. GIS/GPS Mapping and Inventory
3. Environmental Assessments
4. Urban Forestry Consulting

Our goal is to use our technology and experience to provide efficient long-term control of trees and brush in harmony with the biological ecosystem.

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