



Newton-Evans Research Company's

Market Trends Digest

June 2013



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Newton-Evans Second Quarter 2013

Research Efforts and Topics

Client-based Studies

Fusing Market

Newton-Evans is currently conducting a North America survey of usage and plans for fusing equipment such as fuse links, power fuses, and current limiting fuses. Data is being gathered on utility spending amounts on fusing equipment, most common voltage/current combinations, vendors used, and estimated number of fuses purchased annually.

In-house Studies

Study of CAPEX and O&M Budgets

The 2013 study of Capital Expenditures is nearing completion. As in four previous editions of this tracking study, the survey asks utilities, "Using 2012 as a baseline, please compare your Capital Expenditures in 2012 to your planned Capital Expenditures in 2013" in several categories: SCADA/EMS/OMS; Substation A&I; Protection and Control; Distribution Automation; AMR/AMI; Transmission Infrastructure; Distribution Infrastructure; Cybersecurity: Operations; and Cybersecurity: Enterprise.

A news release that was sent out in May appears on page 4. The completed study is scheduled for publication on July 22nd.

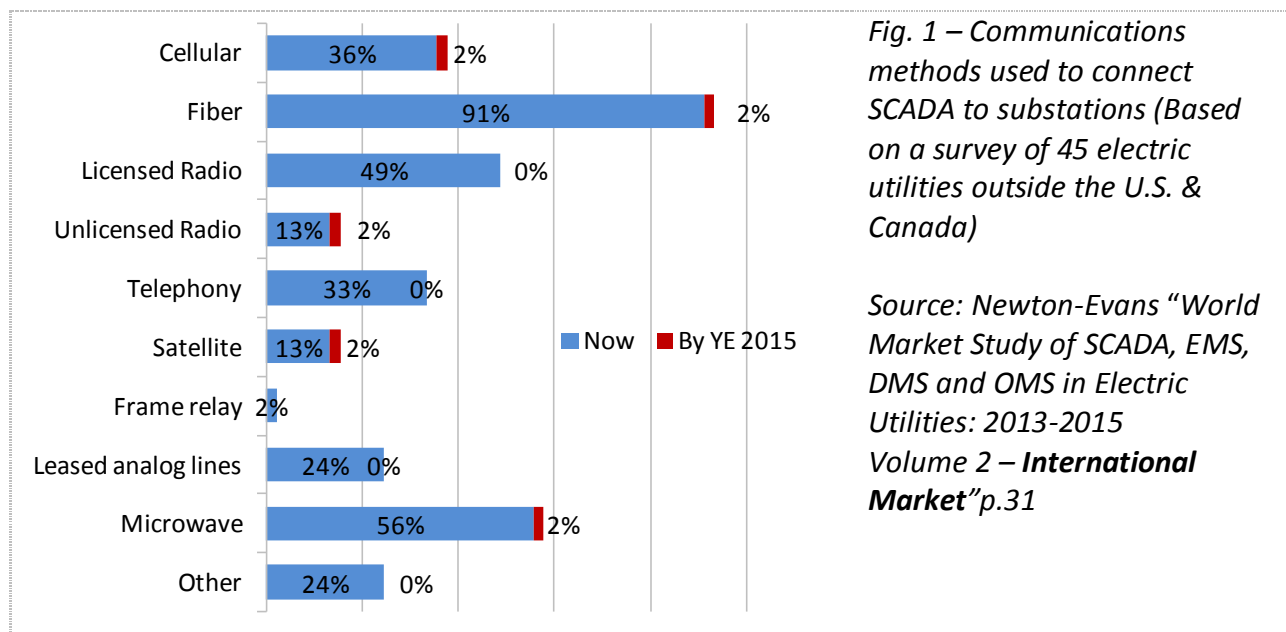


Utility Communications: Excerpts from Newton-Evans Reports

Newton-Evans studies utility data communications use patterns and trends frequently. Here are some excerpts from a few of our recent studies:

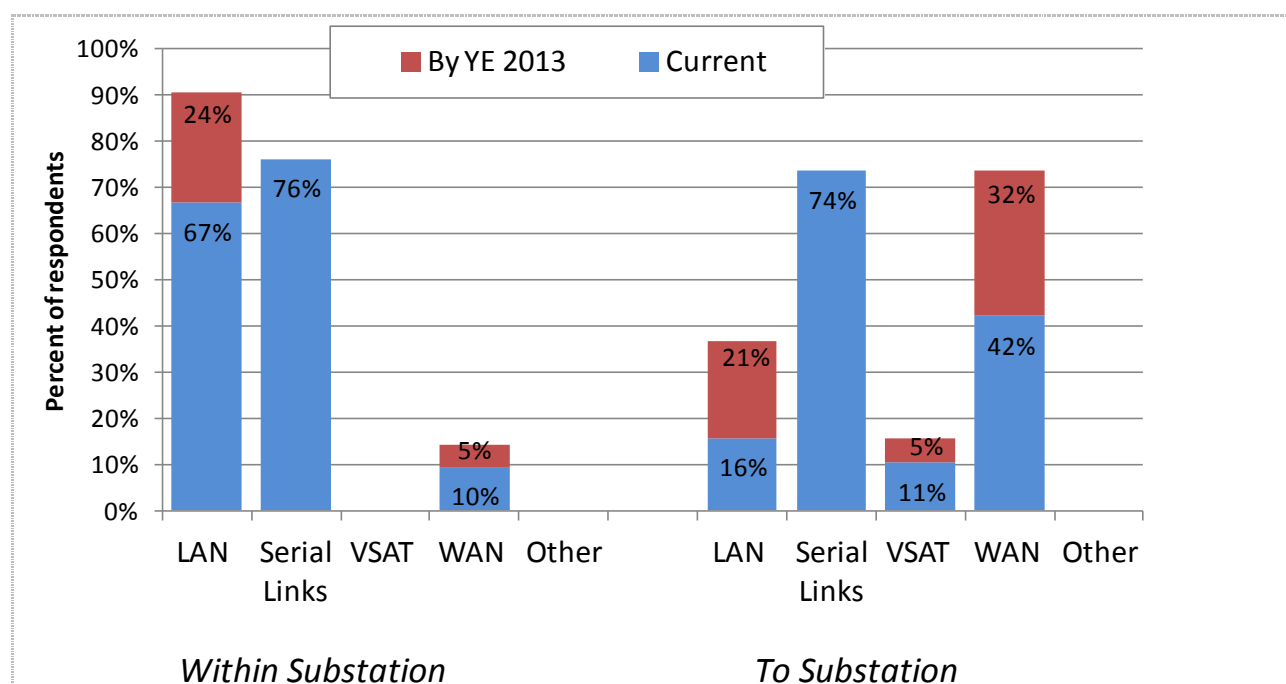
In late 2012, 91% percent of international

utilities responding to a Newton-Evans survey said they used fiber to connect SCADA to at least some substations. All 11 European utilities that responded to the survey used fiber, and 17 out of 18 utilities from the Asia Pacific region also relied on fiber. In Latin America and the Middle East/Africa regions, microwave communications were used more often than in other parts of the world; 8 out of 12 utilities from Latin America and all 4 responding ME/A utilities reported use of microwave communications to connect SCADA with substations. Geography, topography, climate, customer density and breadth of operational service area all impact communications choices. (See Fig. 1 below)



In 2011, serial links were the dominant method

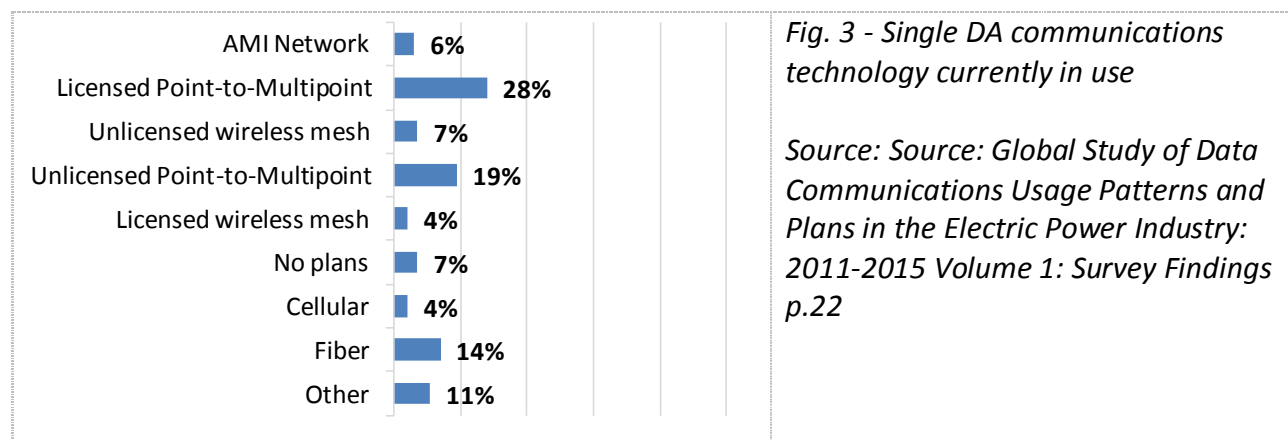
of communications architecture both within the substation and from control systems to the substation. Over 20% of international utilities were planning to add LAN architecture within the substation and to the substation by YE 2013, and about 30% planned to implement Wide Area Networking capabilities. (See Fig. 2 below.)



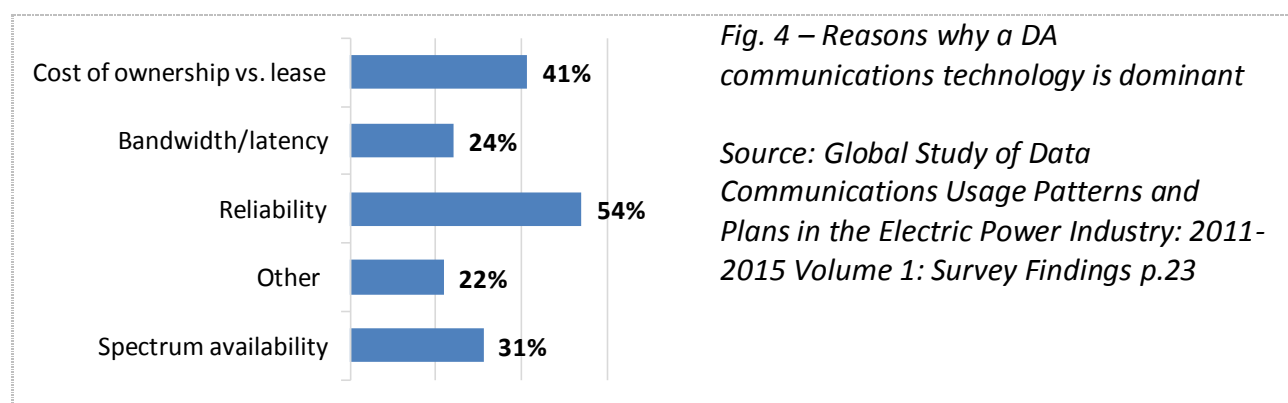
*Fig. 2 – Choice of Communications Architecture Within the Substation and To the Substation
(Based on a survey of 43 electric utilities outside the U.S. & Canada)*

*Source: Newton-Evans "World Market for Substation Automation and Integration Programs in Electric Utilities: 2011-2013 Volume 2: **International Market**" p.40*

In 2011, 28% of utilities selected Licensed Point-to-Multipoint as the dominant technology used for DA communications. Unlicensed Point-to-Multipoint remained in second, as selected by 19% of respondents. However, only 10% of public power utilities selected Licensed Point-to-Multipoint as the dominant technology, while Unlicensed Point-to-Multipoint was chosen by 30% of this sub-group.



In 2011, over half of all respondents cited reliability as a reason why their company's most used DA communications technology is dominant. "Cost of ownership vs. lease" was also a major reason chosen by 41% of all respondents. Cost of ownership was somewhat more important to North American respondents than to those from other regions (47% to 31%).



Other reasons mentioned in the comments were: cost, availability, incumbent technology, geography, network security, vendor supplied technology.

2013 Study of Smart Grid Capital Expenditures and O&M Budgets

The Newton-Evans Research Company today released preliminary findings from its fifth study in the multi-year tracking research program looking into electric power utility CAPEX budgets related to smart grid investments and infrastructure spending plans.

Early findings from utilities in 24 countries that have already participated in the May-June 2013 Newton-Evans global tracking study of electric power transmission and distribution investment indicate that 43% of utilities plan to increase their capital expenditures for 2013 on EMS/SCADA/OMS. Half plan on increasing CAPEX spending in 2013 for protection & control, and 55% plan on increasing Transmission Infrastructure CAPEX. AMR/AMI seems to be leveling out; 63% of respondents so far said there will be no change from 2012 spending on this.

O&M budgets for 2013 reflect a somewhat different story. Most categories of O&M spending were less likely to see an increase from the budgets of 2012. Distribution Infrastructure appears to be the key victim, with 17% of the respondents indicating a lower figure budgeted for 2012 O&M expense for distribution network operations and maintenance activities.

Over one-half of the utilities responding so far (58%) indicated that "Yes," Regulatory Mandates are the reason for CAPEX increases indicated for 2013. Only 13% cited Government Stimulus as a reason for increases in 2013 CAPEX.

Seventy-one percent of responding utilities have mentioned that they plan to start a new smart grid project in the upcoming two years, and 59% of those projects will include some form of distribution automation.

Comparison of 2013 Planned CAPEX Investment for Smart Grid Programs

Smart Grid Component and Infrastructure Category	2012-2013 <u>Increase</u>	2012-2013 <u>No Change</u>	2012-2013 <u>Decrease</u>
SCADA/EMS/OMS	43%	20%	37%
Substation A&I	44%	19%	36%
Protection & Control	50%	11%	39%
Distribution Automation	29%	18%	54%
AMR/AMI	33%	3%	63%
Transmission Infrastructure	55%	6%	39%
Distribution Infrastructure	48%	7%	45%
Operations Cybersecurity	44%	9%	47%
Enterprise Cybersecurity	38%	3%	59%

The new 2013 edition will include information about relative market trends and market size estimates for major smart grid building blocks, including transmission and distribution network control systems, protection and control systems, substation automation and integration, distribution automation, advanced metering infrastructure, cybersecurity as well as for transmission and distribution infrastructure.

Global CAPEX and O&M Expenditure Outlook for Electric Power T&D Investments: 2013-2014 Funding Outlook for Smart Grid Development is the fifth in the Newton-Evans' Research Company's smart grid investment tracking series.

Report subscriptions are priced at \$495.00 and reports can be ordered online now at a 25% discount during May. The final 2013 report will be available in early July. Visit www.newton-evans.com to order or call our offices at 410-465-7316) or simply email your request to info@newton-evans.com.

Since 1978, Newton-Evans has been conducting business-to-business technical survey research for both multi-client and proprietary studies focused on energy industry automation, information technology, and infrastructure topics such Smart Grid. The firm also provides business consulting services for clients addressing energy markets in the computer, communications, control systems and engineered products areas.



Newton-Evans In The News

Smart Grid News May 15, 2013

Smart grid capital spending up, but operations and maintenance budgets threatened

http://www.smartgridnews.com/artman/publish/Business_Markets_Pricing/Smart-grid-capital-spending-up-but-operations-and-maintenance-budgets-threatened-5760.html

T&D WORLD ENERGIZING, May 15, 2013

43% of Utilities Plan to Increase Capital Expenditures for 2013 on EMS/SCADA/OMS

<http://tdworld.com/energizing/study-43-utilities-plan-increase-capital-expenditures-2013-emsscadaoms>

UTILITY HORIZONS, April (1QTR 2013 Edition)

Usage Patterns and Trends in Electric Utility Automation Pages 60-63

<http://www.nxtbook.com/nxtbooks/utilityhorizons/2013q1/#/60>

Transmission and Distribution World, April 2013

Global Utility Telecommunications Special Supplement section, page 10

<http://tdworld.com/smart-grid/global-utility-telecommunications>

Intelligent Utility, March 13, 2013

Current, Planned Global Deployment of Analytics Capabilities

<http://www.intelligentutility.com/article/13/03/current-planned-global-deployment-analytics-capabilities>



Chuck's Viewpoints and Insights on a Variety of Current Newton-Evans Research Topics

By Chuck Newton & Staff

On the “automation” side of the industry, Newton-Evans completed its most recent EMS/SCADA/DMS/OMS study earlier in 2013, and recently undertook client studies of capacitor bank controls and precision timing requirements for substation modernization, including the use of synchrophasors. Late spring has brought us once again into the “infrastructure” side of electric power delivery studies. The following is a summary of information gathered on research projects for clients interested in transformer oils, HV/MV instrument transformers and distribution fusing products.

New transformer oil study completed: transformer oil is taken for granted, but it is more important than we may realize!

Did you know that electric power transformers of all types installed and operating in the United States are filled with more than one billion gallons of specialty oil? Furthermore, if you add in other types of oil-filled apparatus used in the electric power industry (utilities and industrial/commercial), Newton-Evans' findings indicate that well over 2.5 billion gallons of mineral oil are in use helping to keep all of this transmission and distribution equipment in good operating status. Transformer oils play a key role in helping to keep the lights on in the country and around the world. About 15 companies supply nearly all of the required annual volume of transformer oils, which are subjected to rigorous testing procedures established by IEEE, ASTM and IEC.

According to a paper by Professor B. Pahlavanpour and Dr. M. Eklund of Nynas Naphthenics,

There are two broad types of mineral oil, namely paraffinic and naphthenic.

Paraffinic oil is derived from crude oil containing substantial quantities of naturally occurring n-paraffins (wax). Paraffinic oil has a relatively high pour point and may require the inclusion of additives to reduce the pour point.

Naphthenic oil is derived from crude oil containing a very low level or none of naturally occurring n-paraffins (wax). Naphthenic oil has a low pour point and requires no additives to reduce the pour point. Naphthenic oil provides better viscosity characteristics and longer life expectancy, and sludge is soluble and thus does not deposit out on windings, blocking cooling ducts and reducing cooling efficiency.

Source: "Development in Maintenance of Insulation Liquid," Professor B. Pahlavanpour and Dr M. Eklund, Nynas Naphthenics AB, SE-149 82 Nynashamn, Sweden
http://www.electricenergyonline.com/?page=show_article&mag=10&article=74

However, according to analysts at *MarketsandMarkets* research company, there are some key concerns:

the corrosive nature of sulfur present in transformer oil and flammable nature of mineral oil based transformer oils. Transformer manufacturers have started using bio-based oil which has higher dielectric strength and flash point, and lower pour point.

Source: "Transformer Oil Market: By Types (Mineral Oil - Naphthenic & Paraffinic, Silicone and Bio-based), Applications (Small & Large Transformers, Utility) & Geography - Global Industry Trends & Forecast to 2017," *MarketsandMarkets* - March 25, 2013 ABSTRACT
<http://www.marketresearch.com/MarketsandMarkets-v3719/Transformer-Oil-Types-Mineral-Naphthenic-7468684/>

High voltage and medium voltage instrument transformers in the united states: providing the required power values to operate relays and instruments in electric power substations

HV instrument transformers are being used today to lower voltages and current in substation environments to enable the powering of intelligent electronic devices, including relays, meters, and a variety of recorders. Up until a few years ago, a group of independent manufacturers led the North American and

international market for these products, and included Trench, Ritz and Kuhlman. Today these firms are part of global companies (Siemens now owns Trench, Alstom Grid now owns Ritz, and ABB now owns Kuhlman). Clearly these firms saw growth potential in this HV market segment to justify their acquisitions of the key suppliers.

The MV range of instrument transformers manufactured for North American consumption (as well as some international shipments) is supplied by a different grouping of manufacturers that includes Meremac, ITEC, GEC Durham, GE and SEL.

Newton-Evans estimates that the combined HV and MV market for instrument transformers will approach \$400 million in North America by 2015, and thus, likely to be about \$1.4-1.7 billion worldwide market.

Fusing study: penny-wise and pound foolish?

In one of the most difficult (tedious) surveys undertaken over the years by Newton-Evans staff, the subject of fuses is often best left to the Purchasing Departments, since these are treated as “commodity” items in most electric power utilities. Nonetheless, fuses (including fuse links, power fuses and current limiting fuses) are vital components in electric power distribution networks. Fuses absorb the blows to the networks and to power distribution equipment when storms occur and accidental damage to grid components happens. Once they do their job, fuses are replaced on a one-for-one basis.

Because of their low technology status, they are often initially specified (and perhaps provided) by distribution equipment manufacturers, or summarily reviewed by distribution engineering departments, then turned over to Purchasing, with sufficient spares ordered and stocked for the numerous planned and unplanned outages that occur in every network. There are literally more than one hundred combinations of fuse links and another hundred voltage/current/speed combinations of power fuses in use in North American electric power utilities today.

What is interesting about this basic component market segment is its sheer size. Like paper clips in the office, fuses are ubiquitous and low-cost, but when you add up the millions of fuses used to keep the electrical grid operating at strong levels, the market size becomes “interesting” and significant, to say the least.

Not only that, but there are only a handful of manufacturers currently active in supplying fuses, fuse links and power fuses to the North American market. The Newton-Evans study has found Cooper, S&C and Hubbell to be the leading suppliers of fuse links, while power fuses are the domain of S&C and Eaton-Cooper. Current limiting fuses bring ABB into this picture as providing the major competition to Eaton-Cooper.

Two of the sub-topics being studied include the use of refillable versus one-time usage, full range versus backup-companion types, and indoor versus outdoor applications for power fuses.



Who's Really Controlling the Grid?

By Liz Forrest

For the better part of a decade we have known cybersecurity as a possible threat, but the threat has become immediate and alarming. Such threats are actively affecting our nation's utilities in attempts at disruptions of power delivery. In the past month alone, accusations have been leveled against both China and Iran for attempting to hack into our nation's energy system. While the cyber threat is not new, it is indeed real. In addition to malware threats, the grid could be susceptible to disruption via physical threats such as electromagnetic pulse (EMP) and geomagnetic disturbance (GMD).

We wanted to look at what was actually being done within the utility community to address these risks, and what still needs to be done in the immediate future. After all, it has been more than six years ago that the first known cyber attack, which was a controlled attack undertaken by Homeland Security at the Department of Energy's Idaho National Laboratory. According to the Markey report,

In 2006, the Department of Homeland Security's Control Systems Security Program conducted an analysis—performed by the Department of Energy's Idaho National Laboratory—that demonstrated an attacker could hack into the control system of an electric generator or other rotating equipment connected to the grid and throw the equipment out of phase, causing severe physical damage to the equipment.

The Markey-Waxman report released in May 2013 noted that a Northeastern power provider said that it was “under constant cyber attack from cyber criminals including malware and the general threat from the Internet, and like many energy organizations [it] comes under the scrutiny of activists.” Also,

...one federal entity that owns a major piece of the bulk power system reported a Molotov cocktail was thrown at a dam. Another reported that during a copper theft, phone lines were cut which resulted in a loss of connectivity to some supervisory control and data acquisition systems and consequently impacted some electric generation assets. The incidents described by utilities highlight the potential for terrorists to access portions of the bulk power system for purposes of carrying out physical attacks.

Last year, Newton-Evans undertook a study to look at what mid-sized utilities are doing to keep their grids secure. Thirty municipal and cooperative utilities participated in the client-funded survey. The average size of participating utilities was 87,000 customers including one outlier with more than 500,000 customers. The median size was 51,000 customers.

Report findings showed that fifty percent of respondents spent more than \$25,000 on cyber security Operations and Maintenance in 2011, with more than a quarter of them spending \$100,000 or above. On average, cyber security amounted to about one dollar per year per customer, for this group.

Nearly a quarter of respondents also reported that their percentage increases in CAPEX related to overall cyber-related spending caused by NERC CIP compliance requirements.

Since we are able to retain anonymity of our respondent-base, our study participants were more forthcoming about utilities' concerns of cybersecurity and the grid than what power companies have discussed with the federal government, although the results of the studies are closely corroborated. The somewhat alarming new cyber security study released by Congresspersons Markey and Waxman proves that time is not on the side of American utilities in implementing additional cyber security measures.

Apparently, neither are the concerns for funding, skills development or clear new legislation. There are obstacles impeding utilities from moving forward, and not all of them are obvious. First, there is the issue of how much security investment is needed to be "secure enough." It appears that investor owned utilities have been trying hard to implement the 9 NERC CIP guidelines which have gone through several iterations over the years. However, most utilities have not implemented anything other than the mandatory guidelines. Many small-to medium-sized utilities are left to wonder if they need to implement any, some, or all of these guidelines, or if they should defer to their local governments or even to what the security industry consulting and tools provider firms are suggesting. It appears that there is confusion caused by multiple federal and state agencies releasing somewhat similar, sometimes overlapping, but disparate recommendations and guidelines.

Then there is the issue of financing. In the last decade, this industry has had to continuously expend money for updated compliance measures and smart grid

(non-security-related), and some utilities are still paying for the havoc caused by the spate of super storms in recent years.

What needs to be done? In an interview with Kathleen Wolf Davis, Editor-in-Chief of Intelligent Utility earlier in June, Newton-Evans' President Chuck Newton stated, "I believe firmly that smaller and mid-size utilities (read as the 2,700+ munis and cooperatives) want a safe and secure operating environment, but don't have either the financial or human resources necessary to make this happen. The increased reliance on IP-based communications and hybridization of utility-operated networks has not alleviated this concern; rather this transition has adversely impacted cyber security, in my view. If further smart grid funding becomes available via the U.S., I hope it will be directed to shoring up cyber defenses. If our nation's defense equipment plans can be hacked, I fear that there are some weak links in our utility networks that may be ripe for extortion, or worse." Newton went on to say, "While it may not look progressive to some observers, there remains a requirement for operating utility operational networks in isolation. There is no urgency to share true real-time information outside of operations, other than via downloads into historical databases. Period. Clearly, utilities with critical assets under NERC directives must exchange information with ISO/RTOs and neighboring utilities and with energy market management systems, but this can and must be done in a secure, restricted manner with multiple levels of security authorization in place."

In conclusion: cyber terrorism may well be the warfare of the future, but the battles have already begun. A great first step that needs to be taken by utilities must include keeping vital information from being accessible beyond those personnel and systems with a verified "need to know", should a utility's intranet be hacked. Another important step would be clear mandates for what is necessary, set forth by a Congress-appointed governmental authority entity, and perhaps some funding from the federal level, earmarked only for cybersecurity, (including the human factors necessary to implement the guidelines).

The full Markey Grid Report is available to read here:

http://markey.house.gov/sites/markey.house.gov/files/documents/Markey%20Grid%20Report_05.21.13.pdf

