



Newton-Evans Research Company's

Market Trends Digest

December 2013



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World Market for Substation Automation & Integration 2014-2016

The following is a summary of preliminary observations based on a mixed group sample of the first 75 substation automation survey respondents. This second sample consists of electric T&D utilities in 20 countries; 49 U.S., 6 Canada, 9 from Asia-Pacific, 3 from Latin America, 2 from the Middle East and Africa, and 6 from European countries. The final report - when it is released in January 2014 - will show data broken out by world region, type and size of utility (measured in number of customers and number of T&D substations.) Previous study findings from several earlier editions of the study will also be presented for comparison.

1. Potential obstacles to implementing substation automation and integration for both new and retrofit substations through year-end 2016

2013 Interim Observations:

The preliminary findings as of December 2013 indicate a continuation of the “downward trend” in ranking of obstacles to substation automation projects, but as we receive more international surveys, there remain some significant obstacles reported for both new and existing substations. Most of the reported moderate-to-serious obstacles are the same for both new and retrofit situations. For example, utilities ranked “not enough skilled internal staff” and “security concerns” at the top of the list for new substations, while “lack of funding” and “security concerns” topped off the list for retrofit activities. Business justification was also viewed as a potential obstacle for both new and retrofit activities.

2. External Spending Outlook for New and Retrofit Substation A&I Programs

2013 Initial Observations:

Initial observations suggest that budgeted amounts being reported for the upcoming 36 months may be larger than found in prior studies. To date, we have accounted for about \$550 Million in planned spending for automation projects with new substations, and about 50% again (\$275 Million) for retrofit activities.

3. Level of automation of the utility's transmission and distribution substations

2013 Initial Observations:

To date, more than 3508 transmission substations are accounted for, with plans for constructing more than 350 new HV substations among the early respondents. More than 21,400 MV substations are accounted for among the group, with plans for adding other 1200-plus units, mainly among a few international sites. More than 90% of substations (HV and MV) do have at least some level of automation at this time. (RTUs, IEDs, two-way communications).

4A. Choice of protocol within the substation, between substations, and from the substation to the external host or network

2013 Initial Observations:

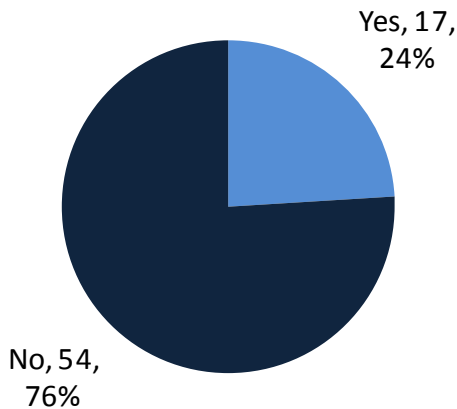
A few notes of interest among these 75 respondents to the 2013 study. DNP 3 remains dominant in North America. However, SEL protocols (Mirrored Bits, Fast Message) are also widely used (our earlier studies did not list these protocols separately). Interestingly, Modbus variants are still important to a good percentage of municipals and cooperatives (and some IOUs) in North America. IEC61850 use continues to make some progress among some large North American utilities as well. Interestingly, we have uncovered reports of continuing use of older legacy protocols including Conitel, CDC, Motorola Intrac and others.

4B. Encryption of Protocols

2013 Initial Observations:

Among the group of 75 utilities responding to date, 24% reported any use of encryption, primarily in transmission of data from the substation to the control center-based systems. This is a similar level as was reported in 2010.

Fig. 4b Are Protocols Encrypted?



*Four utilities declined to answer

This new 4-volume Substation Modernization report series will provide a great deal of technical market insight and will profile more than 75 companies around the world as well as developing regional outlooks for substation modernization expenditures. For more information on this report series, or to inquire about purchasing, contact us at +1 410 465 7316 | info@newton-evans.com Or visit our reports page: <http://www.newton-evans.com/our-reports/>



Newton-Evans 2013 Year In Review

Here is a summary of topics researched by Newton-Evans Research Company in 2013

Global CAPEX and O&M Expenditure Outlook for Electric Power T&D Investments: 2013-2014 Funding Outlook for Smart Grid Development Based on Summer 2013 Survey Results

Newton-Evans revisited this survey topic for the fourth time in early spring and summer of 2013. Responses from 85 upper level managers and senior staff directly involved with transmission and distribution planning in 30 countries indicated a view marked by moderate growth for electric power T&D CAPEX experienced since 2010, but continuing low growth for OPEX. Newton-Evans anticipated good growth during 2013 and into 2014.

Assessment of the North American Market for Capacitor Switch Controls

This client-based survey queried 18 Investor Owned utilities, 36 Public Power utilities, 41 Cooperatives and 9 Canadian utilities to provide our client with the market sizing and product/service usage patterns and planning information they wanted regarding the North American market for capacitor switch controls. Among the findings in this report were market estimate sizes for 2011 and 2012 and forecasts for 2013-2015; competitor shares: by dollar volume, and by type, for cap bank switch controls; an estimate of the percentages of SCADA-controlled capacitor banks; and a discussion of how utilities use cap switch controls today.

Assessment and Overview of the World Market for Time Synchronization in Electric Power Substations: A Utility and Industry Survey-Based Report on Precision Timing Requirements

During the second and third quarter of 2013, Newton-Evans Research Company undertook a two-pronged research program to determine the current usage patterns and mid-term plans among electric utilities for implementing time synchronization, the use of various time reference standards and the role of GPS. Concurrently, manufacturers of substation devices were queried about the extent to which their products and equipment supported precision timing protocol.

By August 1, Newton-Evans had received usable survey responses (or replies) from 17 manufacturing company participants, 57 utilities from nearly 30 countries, and substation engineering teams from six major transmission and distribution engineering consulting firms.

IRIG-B was the most important timing reference as indicated by both utilities and suppliers in the survey, but many suppliers also indicated that they support NTP (Network Timing Protocol) as well. According to a few comments from suppliers, precision time protocols necessarily introduce a level of complexity and cost, and unlike the vendors, “users are not necessarily showing similar interest maybe due to lack of knowledge.”

Observations and Overview of the U.S. Market for Fuses and Fusing Products Among Mid-sized Electric Utilities: A Utility Survey-Based Report

One of the goals of this client-based study was to measure the number of fuse links used by utilities annually, as well as the most common amp ratings and speeds. The survey also asked utilities to estimate the percent of fuses purchased from a few major manufacturers. The types of fuses covered in this project included power fuses, fuse links, and current limiting fuses.

These 38 utilities serve a combined total of 8.238 million end user customers, or about 6% of the 144.5 million U.S. electricity end users.

Mid-2013 Assessment and Outlook of the Market for Medium Voltage Fault Current Limiters (July)

Newton-Evans Research Company began work during 2012 on a study of the U.S. market for Medium Voltage Fault Current Limiters (MV FCL). Initial work resulted in the aggregation of then-current secondary information on MV FCLs. Contact was established with the officials responsible for FCLs at the two known U.S.-based suppliers that have existing FCL installations (ABB and G&W). Both of these firms actively manufacture, market and provide support for their MV FCL products. Following an initial market assessment, Newton-Evans staff undertook telephone interviews with distribution engineering officials at 42 leading U.S. and Canadian Utilities to discuss use and plans for FCLs.

This 12-page report includes the following discussion points:

- Effect of Network Design on Application of MV FCLs
- MV FCL Market Observations
- Dollar estimates of FCL shipments through 2016
- Market share by end user type and world region
- Summary of observations from supplier discussions

Mid-2013 Assessment and Outlook for the North American Market for HV and MV Instrument Transformers

Topics addressed in this 14-page report include:

- HV and MV Instrument Transformer Market Participants
- Medium Voltage Instrument Transformer Discussion
- Typical HV and MV Instrument Transformer - Unit Cost Ranges
- North American Instrument Transformer Market Size Assessment
- Estimates of Percentage of HV IT shipments that are CT versus PT/VT
- IT Market Observations from Industry Experts
- Voltage Range Assessments for HV IT equipment shipments in 2012
- Applications of HV CTs in the United States

American Manufacturing and Systems Integration Capabilities for Power Grid Modernization

This 41-page report is an update to a client-based study conducted in 2012 on the question of American manufacturing readiness to provide key grid modernization components, as identified by the Department of Energy (DOE) in its Smart Grid Investment Grant program (SGIG) begun in 2009.

Newton-Evans Research has discussed the issues surrounding manufacturing readiness and systems integration capabilities with senior electrical equipment manufacturing industry officials, systems integration specialists and expert engineering and operations consultants in both 2012 (using a formal survey) and for the entire year since on an informal basis, using discussions and correspondence. In recent years, Newton-Evans discussed the state of the grid modernization market with scores of manufacturers, integrators and utilities in an ongoing dialogue. As recently as late September, 2013, panel sessions moderated by Newton-Evans' CEO discussed and debated these same grid modernization topics.

Electric T&D equipment and other technology discussed in this report:

Energy storage	Advanced metering infrastructure
Dynamic line rating (DLR)	Smart meters
Operational control systems	Home-area networks (HAN)
Energy management system (EMS)	Smart electricity loads
SCADA	Substation Modernization Programs
Distribution management system	Protection and Control Activities
Advanced Distribution Automation (ADA)	Cyber Security Developments
Outage management system	Time Synchronization
Synchrophasors	Grid infrastructure equipment

ASAT and Alstom: One Year Post-Merger

By Chuck Newton

It has already been about one year since the acquisition of ASAT by Alstom Grid was completed, last mid-December. ASAT had been a small, but growing and successful, Calgary-based provider of substation automation and integration products and services. This acquisition strengthens Alstom's existing Substation Automation operations in Montreal and Philadelphia.

In a late November 2013 interview with ASAT's founder, Manford Kwan, it became clear to this writer that the merging of ASAT products into the global Alstom Grid portfolio has gone amazingly smoothly, much better and much faster than we have seen in several decades of observing similar mergers among technology companies, including those serving the electric power industry. ASAT provides products (DAP substation servers), software (suite of substation automation applications) and services (from training to substation system design, commissioning and start-up to ongoing hardware and software maintenance).

The company's early targets had included upgrades for the D-20 (and other) legacy RTU installations (which still amount to several thousand units deployed throughout North America and elsewhere), and DNP 3 support activities, as well as providing IEC 61850 compatibility, helped broaden its market scope to include Asia. Now with the full support and international sales force provided by Alstom Grid, the company's products and services are being integrated with Alstom's broad MICOM P40 Agile range of substation automation components. Hence ASAT products are being marketed to the global electric power community. As a result of the combined offering, some key projects were awarded to Alstom Grid from Utilities in North America and Asia. These projects enable the utilities to deploy Smart Substation applications such as online condition monitoring for Asset Management, substation cyber security application for addressing NERC CIP requirements and the latest IEC 61805-9-2LE based Digital Substation solution including the MICOM P40 Agile protection IEDS and MU Agile Analog Merging Units.

In North America, ASAT products support both DNP 3 serial and DNP 3/IP protocols. IEC 61850 based architecture is available to the international community as well as a smaller, but growing base of North American 61850 users.

When asked about what separates ASAT from other substation automation specialist firms, Manford discussed the tool kit approach developed for customers. Because each utility has a somewhat unique roadmap and challenges, the DAPserver products and related suite of applications software enables each utility to retain existing substation device investment, all the while

migrating towards a modern substation automation architecture. In turn, this approach provides for a more cost-effective and lower risk approach to substation modernization.

The various modular application plug-ins developed by the Calgary ASAT team include DAPCore, DAPView, DAPGuard and DAP Gateway. These in turn enable utilities to stage and prioritize their automation roadmap with six specific modules including data concentration and protocol conversion; substation HMI capabilities; engineering access; NERC CIP compliance; online condition-based monitoring of substation assets; and linkage to distribution automation capabilities.

For more news about our take on the power industry's recent mergers and acquisitions visit our website www.newton-evans.com/



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Smart grid? Get market smart.

Since 1978, NEWTON-EVANS RESEARCH COMPANY, INC. has been conducting business-to-business market research focused on energy industry automation, information technology, and infrastructure topics such as Smart Grid. We also provide business consulting services for clients in the computer, communications, control systems and engineered products areas. Newton-Evans is recognized as a world leader in research of the electric power delivery industry's use of computers, communications, control systems, and technical equipment and products.

Newton-Evans Research Company is a member of the American Marketing Association (AMA), The Council of American Survey Research Organization (CASRO), the Institute of Electrical and Electronics Engineers (IEEE), CIGRE, and the Utilities Telecom Council (UTC). Newton-Evans Research is an associate member of the National Electrical Manufacturers Association (NEMA).

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Cybersecurity: Still Time to Heed the Warning Signals

By Chuck Newton

Mid-year of 2012, alarm bells started ringing in earnest about cyber-security issues confronting the global electric power utilities community. These alarms have grown louder with each passing month. I really cannot explain why this has become the key issue and topic of conversation at many power conferences. However, I do believe that the information being provided by government and regulatory officials in many Western and Asian nations is indeed relevant to both aspects of grid security – cyber and physical. It seems that FERC has been keenly interested lately in physical security, while NERC, DOE, DHS, NIST and others are clearly focused on improving cyber-security and the White House promoting its cyber-framework efforts. Here is a quote from Michael Daniel, Special Assistant to the President of the United States and Cybersecurity Coordinator:

The systems that run our nation's critical infrastructure such as the electric grid, our drinking water, our trains, and other transportation are increasingly networked. As with any networked system, these systems are potentially vulnerable to a wide range of threats, and protecting this critical infrastructure from cyber threats is among our highest security priorities. That is why, earlier this year, the President signed an Executive Order designed to increase the level of core capabilities for our critical infrastructure to manage cyber risk. The Order does this by focusing on three key areas: information sharing, privacy, and adoption of cybersecurity practices.

- <http://www.whitehouse.gov/blog/2013/08/06/incentives-support-adoption-cybersecurity-framework>

While some of our own concern is based on findings reported in 2012 and 2013 studies conducted by Newton-Evans, more is based on what we are hearing lately from senior industry and government officials. Below is a link to an article I had written on June 25, 2012 concerning cyber security and the electric power grid. The article was titled *Looking at Smart Grid Opportunities For Growth At Mid-Year 2012What Stands In The Way?* The full article from June 25, 2012 can be found here:

<http://www.newton-evans.com/looking-at-smart-grid-opportunities-for-growth-at-mid-year-2012-what-stands-in-the-way/>

More recently, in July 2013, I wrote an article on cyber security for Energy Central's daily newsletter INTELLIGENT UTILITY. That article is entitled Letters from the Knowledge Summit: Chuck Newton and Operational Changes. This article can be found on the Intelligent Utility archives.

After participating in this November's KNOWLEDGE conference and listening to Mr. Philip B. Jones, the outgoing President of NARUC, speak on the growing threats posed by cyber terrorists who want nothing short of bringing down the nation's power grid, I decided it was time to prepare an update for our readers.

Even now, in December 2013, with our very latest control systems-related study well underway, we are finding that only about one quarter of utilities here and abroad are using any encryption techniques in their operational data transmission activities (from substations to external sites). Other recent studies have found low levels of cyber and physical security investments and few professional personnel dedicated full-time to security issues (other than at the largest utilities).

The mission statement: keep the lights on at all costs!

The key strategy: shore up cyber and physical defenses.

The tactical support:

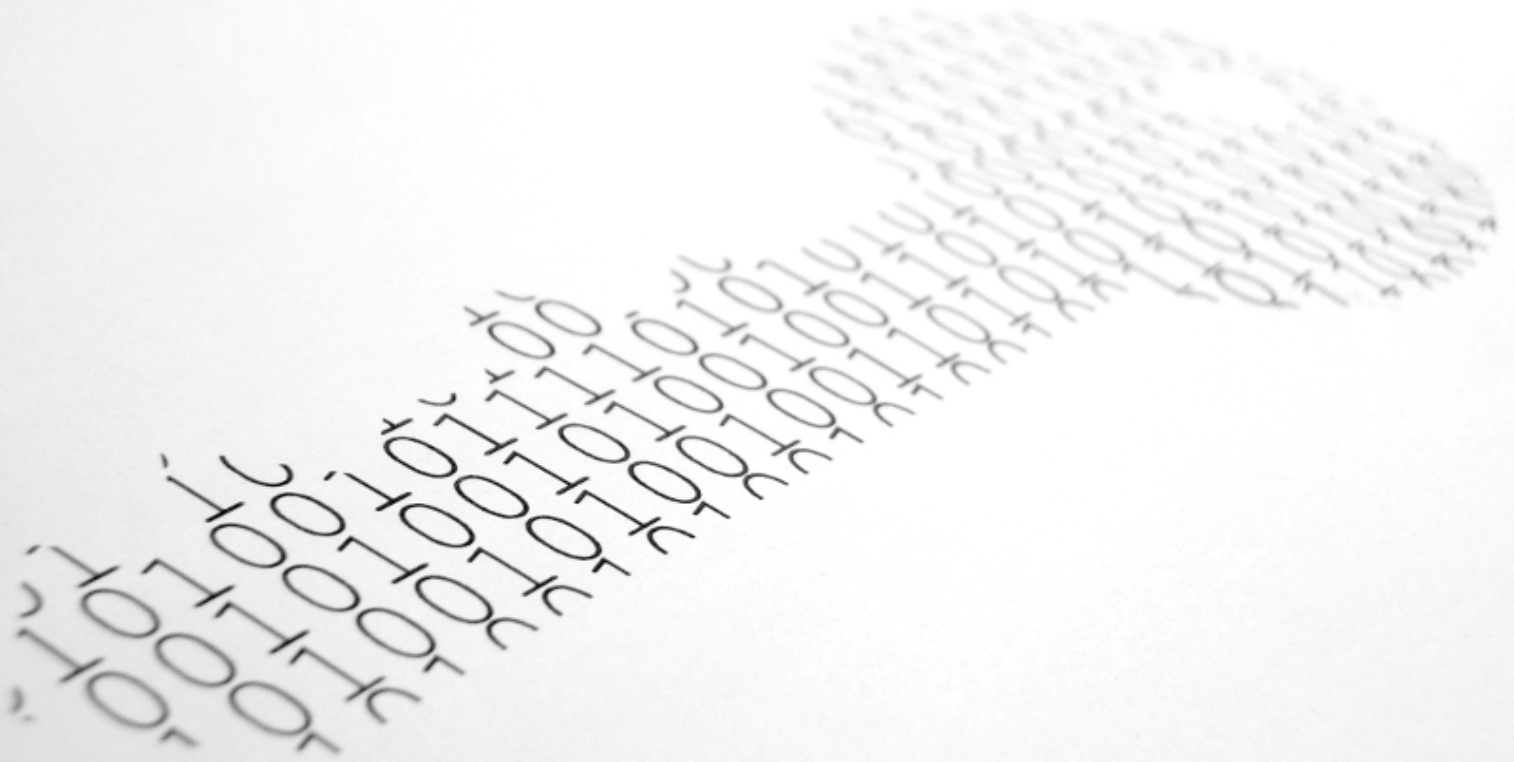
- Be in compliance with all developing federal, state and local regulations and recommendations.
- Isolate control systems with effective barriers. Keep the systems "closed" and isolated to as great an extent as possible.
- Conduct penetration testing of all control systems on a regular, recurring basis.
- Get real about developing a sound cyber-security budget for systems, software, services and personnel training.
- Take advantage of the many opportunities funded by the federal government through programs like DOE CEDS, DHS ICS-CERT and others. See: <http://ics-cert.us-cert.gov/Training-Available-Through-ICS-CERT> for one such example.

As a nation, and as part of the global community of democratic nations, we must increase penalties for cyber-crime to make this "career choice" much less interesting. For international sources of cyber-crime, we need to work closely with international police forces and intelligence agencies to root out the

individuals, crime syndicates and any state-sponsors responsible for serious cyber-crime. The international community must develop and publicize significant penalties to those who would do harm to any part of the world's electric power grid. It is the provision of electricity that serves as the underlying economic engine and lynchpin of the modern world. Causing harm to this and other infrastructure results in injuries, illness and deaths of innocents and destruction of economic progress around the globe.

It is time now to heed the warning signals, not to alarm, but to better prepare!

If you have questions about the market for cybersecurity products or services in the electric transmission and distribution industry, give us a call at +1 410 465 7316 or email your request to info@newton-evans.com



Distributech 2014: A Look Ahead

Distributech 2014 takes place Tuesday through Thursday, January 28-30, 2014 in San Antonio, TX at the Henry B. Gonzalez Convention Center. Just like in years past, this conference will host hundreds of exhibitors and tens of thousands of attendees. Newton-Evans Research Company President Charles Newton will be a panelist on Wednesday's "Mega Session 5" to discuss the future of Smart Grid and Grid Modernization as the related technology is implemented around the globe.

Mega Session 5: Wednesday, Jan 29

A Global Look at Smart Grid's Progress and Future

Smart grid installations have been underway around the world for a number of years and lessons have been learned. The panelists in this mega session will present an overview of global market trends, an analysis of where smart grid stands and their predictions for its future, as well as share some experiences from projects around the world. They will discuss some of the lessons learned in real implementations, including investment experiences.

Panel Moderator:

Marco C. Janssen, CEO,
UTInnovation

Panelists:

Albert Cheung, Head of Energy Smart Technologies, Bloomberg
New Energy Finance
Charles Newton, President, Newton-Evans Research Co. Inc.
Heiko Staubitz, Senior Manager, GmbH Germany Trade and Invest

Download an Event Guide here:

<http://digital.pennwell.com/pennwellevents/dtechprelimguide2014>

Registration is now open! Visit the Distributech website:

<http://www.distributech.com/register.html>

