

electroindustry



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Protecting the IT that Protects Your Supply Chain

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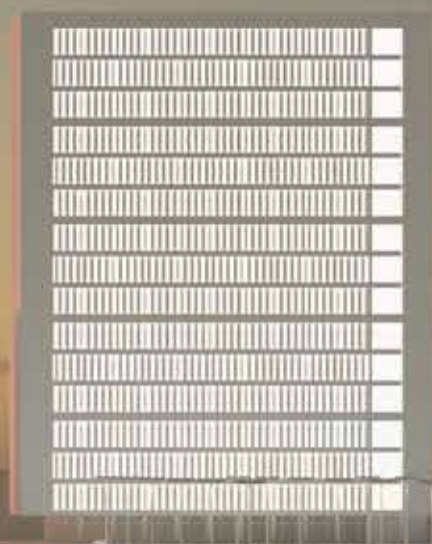
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FROM THE **PRESIDENT**

Urbanization on a global scale seems inevitable, at least according to the United Nations. A 2016 report estimates that by 2030, two-thirds of the world's population will be living in cities.

Think about these numbers: Today, 55 percent of the world's 7.6 billion people live in cities. The world's total population is expected to increase to 8.5 billion in 2030 and 9.7 billion in 2050. Contrast that with 1950, when 30 percent of the 2.5 billion people worldwide lived in cities.

To meet the burgeoning needs of global cities, goods and services must be delivered consistently and reliably across multiple systems—virtually all of which rely on electricity. Ensuring delivery on this scale is called surety. It relies on physical systems that must perform consistently well along with the information systems that generate and monitor the massive data inherent in our digital 21st-century supply chain.

According to research and advisory company Gartner, Inc., one million new devices *per hour* will be connecting online by 2021, each generating unprecedented amounts of data. It is this influx of data that poses the greatest threat to our communication infrastructure. Issues involving privacy expectations and cybersecurity risks in particular need to be researched in order to sustain the cities where the concentration of people creates the most complex challenges.

Recognizing this need for more informed research, NEMA formed the Transportation Systems Division to broaden NEMA roles in the movement of goods and people in safe, cyber-secure, and efficient ways. Member companies are well positioned to play a leading role in the electrification of America's transportation system, which accounts for 25 percent of total U.S. energy use. Similarly, NEMA is also working to form a new Building Management Systems Section to expand our traditional focus from device-level to systems-level thinking.

The electroindustry is ideally suited to deliver surety given its history of producing quality products assembled into massive systems capable of sustained delivery of electricity across continents. The proliferation of connected devices, especially in the urban environment, will demand an even higher level of assurance as well as provide electrical and medical imaging manufacturers with significant opportunities domestically and abroad.

In 2018 and beyond, NEMA is positioning itself to lead in the global market of urbanization by providing cutting-edge technical guidance for this converged world—a world powered by infotricity. 🌐

Kevin J. Cosgriff
President & CEO

Just Announced: New Product Showcase

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Copper Essential to Green Energy

Copper is an essential raw material and nearly 28 million tons are used annually to increase the efficiency of numerous electrical technologies that power our every move—from motors, transformers, and the energy grid to new and evolving technologies of renewable energy systems.

Copper is the industrial metal of choice because of its superior reliability, efficiency, and performance, all the while being 100 percent recyclable. These same physical properties are also vital in the collection, storage, and distribution of energy from solar, wind, and other renewable sources. As the world continues to move toward a sustainable and energy-efficient future, and major investments are being made to upgrade the nation's infrastructure, copper has a major role to play in the energy revolution.

Here's how:

ELECTRIC VEHICLES AND EV INFRASTRUCTURE

Copper is integral to the growing adoption of electric vehicles (EVs), with the total number of EVs projected to reach seven million by 2025. While conventional cars have 18 to 49 pounds of copper, electric vehicles can have 85 to 132 pounds of copper. Every EV also requires a charging station, which can contain up to 18 pounds of copper. To keep up with expected demand, this could equate to 216,000 tons of copper by 2021.

RENEWABLE ENERGY TECHNOLOGIES

Renewables such as wind and solar infrastructure can have up to 8.6 tons per megawatt (MW) of copper wiring, tubing, and cable. They offer a potential copper usage that's up to five times greater than traditional electrical generation. The generation of electricity from renewable energy has a copper usage intensity that is typically four to six times higher than for fossil fuels.

GRID AND ENERGY STORAGE

Forty-five percent of all copper used is found in the U.S. electrical grid, with copper demand expected to increase as upgrades are made to integrate renewable energy sources, increase energy storage capacity, and create a more secure energy grid.

The market for energy storage in the U.S. is robust and rapidly changing. Copper plays a significant role in the fundamental design of battery cells, with copper content in storage installations ranging to about four tons of copper per MW.

Virtually all electric power in the country will continue to pass through at least one distribution transformer before it is consumed. About a million of these units are produced and sold annually in the United States alone. Premium, high-efficiency, copper-wound units result in significant savings over the lifetime of a transformer compared to a lower-cost, low-efficiency, aluminum-wound unit.

MOTORS

What is a common factor in all of the above?
Electric motors.

Motors are abundant in commercial facilities and industrial plants, where they power fans, pumps, compressors, and exhausts as well as manufacturing and assembly equipment. They're also the building blocks for the entire sustainable energy market, helping to shift our independence away from fossil fuels. Motors use approximately 260 million tons of copper, in the form of wiring and, according to the U.S. Department of Energy, account for nearly 23 percent of all electricity generated in the U.S.

As the U.S. transitions to a green energy market, it's clear that copper is an important factor in meeting the market demand. When it comes to electric vehicles, energy storage technologies, wind and solar energy, and upgrading the electrical grid, copper remains the most reliable, efficient, and high-performing material of choice. ☞

For more information, contact Zolaikha Strong at zolaikha.strong@copperalliance.us, 202-558-7625



**Copper Development
Association Inc.**
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Owning the Customer in a Data-Driven World

As business leaders, we all want to own our customers and have the ability to anticipate their needs. Those relationships ensure that we have a loyal group of customers that aren't going to go anywhere.

Owning the customer is becoming more of a challenge though. Customers are more connected. They have more choices. They have high expectations. They want more value than what's described in the features and benefits of the products or services you offer. They want someone who understands their business as well as their customers. They want a trusted partner.

In order for distributors to be trusted partners, we need to learn more about who our customers are, what they need, and what keeps them awake at night. We need to evolve from what we've done in the past—marketing and selling a product or service—and begin to think about the whole customer experience. We are living in a data-driven world. In order to remain competitive, we need to be able to harness and use the data available regarding our customers.

Soon, you will begin to notice a change in how the National Association of Electrical Distributors (NAED) supports its members by improving their overall experience. As we change and grow, we will focus much of our efforts on how we can help our members own their customers. We will begin providing the resources electrical distributors need to improve the long-term relationships they have with their customers.

According to Forrester Research, the only sustainable competitive advantage in this age of the customer is knowledge of and engagement with customers. The fact that people are buying your products is not important. What's important is why they are buying your products. Increased competition and new sources of information that come from each interaction can give you new tools to better engage with your customers.

Think about how many touchpoints and interactions your associates have with your customers. If you look at the data being generated,



you can identify their pain points and begin to identify trends that will help your business understand the important changes to make and the untapped opportunities to improve the customer experience.

We need to learn how to leverage what we know about our customers to exceed their customer service expectations. When things aren't working as we expect, we need to fail fast and move on to a strategy that does work. Take Netflix, for example. They are experts at gathering data about their customers and using the information to provide their customers with the quality entertainment they want.

It's time to change the way we deliver the customer experience, embrace opportunities for innovation, and create something better than what already exists. We are looking forward to working with our manufacturer members as we take this journey. ☺

Get the Edge on IoT Architecture



What is the edge and what does it have to do with the Internet of Things (IoT)?

Join us as we learn the benefits of edge computing from:

- Lalit Canaran, vice president of emerging technologies and IoT at SAP, and co-chair of the Industrial Internet Consortium Edge Computing Task Group
- Saurabh Mishra, who drives product strategy for building the next generation of analytical solutions for the IoT at SAS
- Brett Murphy, senior director of market development and industrial IoT with RTI 

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BOOK-A-SPEAKER



Craig Updyke

Craig Updyke, NEMA Director for Trade and Commercial Affairs, spoke on May 21 to the Utility Supply Management Alliance annual education conference in Orlando, Florida, about the Trump Administration's tax, trade, and infrastructure policy initiatives and implications for electric utilities and suppliers. According to event organizers, the session was by far the most attended breakout session of the entire

conference. Attendees rated his topic as relevant—and wanted to hear more. 



Muhammad Ali and Lisa Spellman

Muhammad Ali, NEMA Program Manager, and Lisa Spellman, DICOM General Secretary, MITA, are among the instructors of “Fundamentals of Standards and Conformity Assessment: Basic Knowledge and Tools for Today's Professionals” at the Annual SES Conference, *Dynamic Diversity: Expanding the Future of Standardization*, August 6–9 in Nashville, Tennessee. 



Steve Griffith

Steve Griffith will speak at the EPRI Electrification 2018 Conference, August 20–23, in Long Beach, California. He will speak in the session “Smart Cities: Connecting Buildings, Transportation, Indoor Agriculture, and More,” which is part of a track on breakthrough technologies. 

Do you need an electroindustry subject matter expert to speak at your next event?
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Protecting the Supply of Electricity, Shaping a National Spare Transformer Program

The United States Congress, the U.S. Department of Energy, and many public utilities have stated in recent years that it is critical for the country to create a national spare transformer program to ensure greater grid reliability and resilience in case of superstorms, physical attacks on the grid, and other catastrophic events. It is essential to have spare transformers on hand because the lead time for a single replacement can be as long as 18 months.

Such a spare transformer program, like the one recently announced by Grid Assurance LLC,¹ would cover critical bulk transmission assets such as transformers—typically rated 200 MVA or greater—used in transmission system interconnections that tie power generation and load centers across the country. The DOE's 2017 Strategic Transformer Reserve Report called for an industry-led solution.

Grid Assurance was the first LLC to proceed, collectively having subscribers with transmission facilities in 26 of the continental 48 states, consisting of 31 transmission subsidiaries of AEP, Berkshire Hathaway Energy's MidAmerican and NV Energy, Eversource, FirstEnergy, Kansas City P&L, and National Grid. Other subscribers may join in the future. Grid Assurance operates via a subscription business model where participating utilities have immediate access to these spares following any qualifying event.

Through thorough analysis of catastrophic event impacts, combined with identifying common large power transformer spare requirements for ratings of 230 kV and above, Grid Assurance, with support from ABB and other companies, is helping American utilities to shape the first strategic national transformer spare program.

Once the inventory is established, a strategic reserve must also employ cost-effective and practical maintenance and storage plans. These needs can be addressed by leveraging a digital platform and condition-based analysis.



Photo courtesy of ABB

The unique challenge of a spare program dedicated to high-impact, low-frequency events is how to store transformers that may not be placed into service for several years but still need to be ready for rapid deployment on demand. Warehousing recommendations factoring in important spare parts (including electrical bushings and cooling equipment) are important to consider, as well as geographic differences in terms of seismic, climate, and accessibility conditions.

Grid Assurance, and other programs that may develop worldwide, would potentially require hundreds of transformers to be manufactured in addition to those transformers required for normal grid upgrade purposes.

From the beginning, ABB has played a leading role in creating an industry collaboration to create and build upon a strategic national spare transformer program that is essential to ensuring a stronger, more resilient transmission grid for the future. Ⓜ

William Mao,
Global Product
Marketing
Manager for Power
Transformers, ABB

Mr. Mao has held
various sales and
management
positions in the
electroindustry.

¹ www.gridassurance.com/os/resources/media/Grid_Assurance_Press_Release_Final_2.pdf

Cultivating Supply Chain Integrity with Best Practices and Cyber Hygiene

Steve Griffith, PMP,
Industry Director,
NEMA

Mr. Griffith is the industry director for the Transportation Systems Division and the principal staff liaison for NEMA's Internet of Things and cybersecurity activities.

Whether a breach in cybersecurity results in a power outage (and the resulting disruption to homes, businesses, hospitals, etc.), stolen financial information or intellectual property, compromised medical imaging data, or even a hacked vehicle that can be controlled remotely, cyberattacks have the potential to cause serious harm to life, property, and well-being.

Protecting electrical and medical imaging products and systems from unauthorized access without compromising functionality is an evolving challenge. NEMA Members make products that are used in critical infrastructure around the world. They manufacture increasingly secure products to reduce the risk that these critical systems will be compromised. Furthermore, they understand the shared responsibility they have with multiple stakeholders such as the federal government, private industry, and end users.

Since 2012, NEMA and its Member companies have showcased how industry best practices and standards can secure their supply chains, operations, and products. In 2015, NEMA published an industry consensus white paper on cybersecurity supply chain best practices for manufacturers. NEMA CPSP 1-2015 *Supply Chain Best Practices*¹ identifies guidelines that electrical equipment manufacturers can implement during product development to minimize the possibility that bugs, malware, viruses, and other exploits can be used to negatively impact product operation.

The document addresses supply chain integrity in the United States through four phases of a product's lifecycle:

- **Manufacturing.** An analysis during manufacturing and assembly to detect and eliminate anomalies in the embedded components of the product's supply chain;
- **Delivery.** Tamper-proofing to ensure that the configurations of the manufactured devices have not been altered between the production line and the operating environment;
- **Operation.** Ways that a manufactured device enables asset owners to comply with security requirements and necessities of the regulated environment (Security Development Life Cycle); and
- **End of life.** Decommissioning and revocation processes to prevent compromised or obsolete devices from being used as a means to penetrate active security networks.

Positive feedback launched new opportunities for NEMA and its Member companies to become actively engaged in broader cybersecurity discussions.

NEMA Offers Best Practices to Cut Risks

NEMA CPSP 1-2015 *Supply Chain Best Practices* identifies a recommended set of supply chain best practices and guidelines that electrical equipment and medical imaging manufacturers can implement during product development to minimize the possibility that bugs, malware, viruses, and other exploits can be used to negatively impact product operation. As opposed to being an all-inclusive document, it is a representation of

identified best practices that vendors can implement as they develop, manufacture, and deliver products as part of the supply chain.

NEMA CPSP 2-2018 *Cyber Hygiene Best Practices* identifies a set of industry best practices and guidelines for electrical equipment and medical imaging manufacturers to help raise their level of cybersecurity sophistication in their manufacturing facilities and engineering processes.

NEMA/MITA CSP 1-2016 *Cybersecurity for Medical Imaging* addresses how cyber threats pose a significant risk to patient safety as well as clinical and business continuity in the practice of medical imaging. It also explains why a combination of people, processes, and technologies is required to mitigate these risks. 

Achieving Security

With the increasing trend of Internet of Things (IoT) products and systems, cybersecurity attacks are becoming more sophisticated. Two notable examples are the WannaCry ransomware and the Mirai botnet. The WannaCry attack was propagated through an exploit in an older Windows operating system and affected more than 300,000 computers across 150 countries. The Mirai botnet affected more than 300,000 IoT devices using default or weak passwords and created nearly 600 megabits per second (Mbps) of disruptive internet traffic to all the sites affected, bringing down a huge chunk of the internet.

To achieve security within the domain, there is an increasing need to adapt a good cyber hygiene strategy. This means that we are making sure that devices and systems are protected and maintained appropriately using cybersecurity best practices for anything and everything that connects to the web. This includes organizing security in hardware, software, and IT infrastructure; continuous network monitoring; and employee awareness and training.

NEMA's second major cybersecurity work commenced in 2017. It aimed to develop a document identifying a set of industry best practices and guidelines for electrical equipment and medical imaging manufacturers to help raise their level of cybersecurity sophistication in their manufacturing facilities and engineering processes. The resulting document, *NEMA CPSP 2-2018 Cyber Hygiene Best Practices*,² was published on April 27, 2018.

The guideline document lists seven fundamental principles:

1. **Segmenting Networks**—Separating an organization's manufacturing network (the OT zone) from its business or public network (the IT zone).
2. **Understanding Data Types and Flows**—Manufacturers need an understanding of the applications into which their products are being deployed, as the application often dictates what type of data typically runs through it.

3. **Monitoring Devices and Systems**—In particular the health and security of their devices and systems.
4. **User Management**—End-user capabilities are broken down into four areas:
 - Administration (the ability to add, modify, and delete any user and corresponding credentials within the system)
 - Authentication (the ability to change default passwords upon first login)
 - Authorization (providing role-based access)
 - Auditing (the ability to record user login/logout attempts)
5. **Hardening Devices**—Turning off or disabling a number of device features that are not needed or may have inherent security risks.
6. **Updating Devices**—Knowing when and how to properly patch.
7. **Providing a Recovery Plan or Escalation Process**—What to do if a vulnerability is found in the manufactured device, including the possibility of an active exploit against the device.

With the evolving cybersecurity landscape, NEMA and its Member companies will continue to adapt, advance, and be a resource for stakeholders across the critical infrastructure sectors. A future work project is proposed to address cyber hygiene from the end-user/application perspective. ☺

¹ www.nema.org/supply-chain-best-practices

² www.nema.org/Standards/Pages/Cyber-Hygiene-Best-Practices.aspx

Product Data Drives New Directions



Marjorie Romeyn-Sanabria,
Communication
Specialist, IDEA

Ms. Romeyn-Sanabria is a former journalist, commentator, and editor. This is her first year in the electrical industry.

Propelled by energy efficiency and smart buildings stocked with Internet of Things (IoT) equipment, the new influx of product data is transforming the electrical supply chain. It is shifting from a conventional network of relationships that depend on product knowledge and years of industry experience to a collaborative effort where product data is a universal language and linchpin, enabling innovation in design, aesthetics, technology, and sustainability.

As demand increases for energy-efficient buildings equipped with materials that are both high-performance and visually captivating, the supply chain must continue to adapt. To keep pace with both the external trends and the sheer amount of digital information that informs product selection, dependence on digital product information is increasing, which enhances already existing relationships and forms new ones.

This trend is rippling throughout the supply chain as architects, interior designers, and contractors pursue energy-efficient standards. Energy-efficient buildings not only are good for the environment but also pay for themselves and yield higher rents per square foot.

In the Beginning: Digitization

Without accurate data that is ready at a moment's notice, the supply chain would collapse.

"Relationships between material suppliers, manufacturers, and distributors remain largely the same as in the past," explained Daniel Abbate, NEMA Industry Director of Building Infrastructure. "The difference is that digital monitoring and automation have changed the way they do business and the speed at which they do so. For example, companies can make better estimates on how many materials and products

to purchase, using just-in-time ordering and processing to a large degree. Things happen much faster these days. Now a company can order just enough material for the exact amount of product, saving time and money."

But digitization in the supply chain is no longer enough. Mr. Abbate mentioned that NEMA's High Performance Buildings Council is advocating constructing more buildings and making sure they adhere to local energy-efficiency guidelines. Increased output will put pressure on the supply chain to deliver products on time, requiring both more variety of products and more of the products themselves.

High Performance and Aesthetics

Energy-efficient buildings demand specificity that the channel in its current form can supply only with digital capabilities. As the trend in the electrical industry pushes the supply chain to produce buildings with greater performance capability, state and federal governments are leading the charge.

In 2003, the federal government established the National 3D-4D-BIM program, which allows the General Services Administration (GSA) to more effectively meet requirements for design, construction, and asset management.¹

Although these policies are more than a decade old, states are following suit and demanding more sustainability in commercial and residential buildings.

Earlier this year, New York Governor Andrew Cuomo released an ambitious list of energy-efficiency guidelines to reduce carbon footprints and reduce commercial and residential buildings' energy consumption by 185 trillion BTUs (British thermal units) by 2025.

These new demands surface when it comes to overhauling a building to meet energy-efficiency standards like LEED² and ENERGY STAR³. Buildings everywhere, particularly commercial spaces, now must meet the simultaneous demand of looking good and being good for the environment.

Product Specs Crucial to Appeal

Products are becoming increasingly more complex and diverse both between “behind the wall” (technical and code requirements) and “in front of the wall” (design).

“It used to be that most electrical products were behind the wall, and specifications for safety and the *National Electrical Code*[®] were the primary attributes that electrical contractors needed to determine what can be installed,” said IDEA President and CEO Paul Molitor.

“People are now seeking more information about in front of the wall, the aesthetics and design of products. They’re looking for photos from multiple angles, 3D imaging, and other key product information as they’re making a product selection,” he said.

Behind-the-wall characteristics like power usage are essential when people want to achieve something with their building, whether that’s efficiency or connectedness. Digital product information flowing throughout the supply chain delivers that necessary information for high-performance buildings.

According to Mr. Molitor, these trends are expanding product data’s role. Digital product information powers electronic data interchange transactions between manufacturers, distributors, and, in many cases, end users. Now electronic product information is visible and searchable. Customers are using the published attributes, photos, spec sheets, and warranties to identify products to buy and install.

To meet the new demands of high design, specific online product data available on a moment’s notice is no longer a luxury. It is a necessity to more people, such as interior designers, who are instrumental in product selection.

Patrick Hughes, NEMA Senior Government Relations Director, expanded on why aesthetics of products is becoming more necessary.

“The aesthetics of products has always been important for interior designers. As a result, some NEMA Members differentiate their products based on aesthetics in addition to performance,” Mr. Hughes said.

“On the energy-efficiency side, that is something that is increasing in importance. Product information on the energy and efficiency of a product is something that people are looking at when specifying lighting systems, transformers—really anything in a building that consumes electricity. This is especially important if they’re trying to increase their ENERGY STAR or LEED score.”

New trends are forcing the supply chain to open up to new opportunities that include creativity and innovation. Product data is a conduit to energy-efficient buildings, especially as the number of available products grows exponentially. A contractor must interpret an architect’s vision; a contractor must understand how it applies to the end user; and a distributor who knows the product must get it from the manufacturer. To connect the dots between architect, contractor, distributor, and end user, product data that possesses vital marketing information is critical.

Sustainability and meeting energy-efficiency standards will soon become the norm just as digitization in the supply chain is. The addition of design will push supply chains beyond their traditional roles and into two separate and distinct parts: behind the wall and in front of the wall.

Both pieces are equally important and depend on each other to create a building that is energy efficient, visually appealing, and structurally sound. Product data is the language that not only enhances relationships along the supply chain but also ensures the electroindustry can meet the challenges of trends and developing technology. ☉

The Industry Data Exchange Association, Inc. (IDEA) is the official technology service provider and eBusiness standards body of the electrical industry. IDEA was founded in 1998 through a partnership rooted in the collective leadership of NEMA and the National Association of Electrical Distributors (NAED). Learn more at www.idea-esolutions.com.

1 <https://www.gsa.gov/real-estate/design-construction/3d4d-building-information-modeling>

2 LEED (Leadership in Energy and Environmental Design) is a third-party certification program developed by the U.S. Green Building Council

3 ENERGY STAR is a voluntary program managed by the U.S. Environmental Protection Agency and Department of Energy



Putting Data on the Edge—Protecting the IT that Protects Your Supply Chain

Herb Villa,
Senior Systems
Consultant, Data
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Rittal North
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Mr. Villa has
been involved
in all aspects of
data center and
system design,
installation,
and operations
for more than
20 years.

As the Internet of Things (IoT) continues to grow at an exponential rate, there is a greater need to make things easier, safer, closer, and—critically—more secure, especially in the supply chain.

As data centers and IT spaces in general get bigger and become more complex to support this growth, power consumption of hardware rises, heat density per footprint grows, and bandwidth and latency are stretched to the limit. Because of these factors, we are taking a new look at data centers and moving them—and all the data associated with them—from centralized spaces to the edge of the network. We call it edge computing, or simply “the Edge.”

Employing a distributed, open IT architecture based on decentralized processing power, the edge enables data to be processed by an IoT device itself or by a local computer or server, rather than being transmitted to a data center. The ability to compute, store, interconnect, and analyze data without involving a public cloud adds security and efficiency.

Why the Edge?

As we continue to demand more from online shopping, just-in-time inventory control, and instantaneous trackable shipping, companies supporting this global

delivery network will find increasing benefits from moving their systems closer to the edge, i.e., from the warehouse to shipping hubs and even to their most valuable customers.

Edge computing allows data produced by IoT and related devices to be accessed and processed closer to where it is created instead of using faraway data centers. Historically, data centers were limited to Tier-1 cities such as New York, Chicago, London, and Tokyo. With cloud-based content now mainstream, it has become vital to move the internet’s edge closer to the user. Thus, data is local, instant, and everywhere.

An edge installation can take on many forms, depending on its exact function, level of complexity, and location. It can provide any number of services, such as becoming part of a power grid’s distribution infrastructure. It can also be in a remote location, supporting a series of cell towers, for example, or on an oil rig.

For the supply chain, edge installations are located in the middle of massive distribution centers and transportation hubs supporting land, sea, and air delivery.

They provide the bandwidth to support big data, on-premise applications and services, IoT connections, and storage. The requirements are the same as they would be for the traditional IT system, but as the data becomes more complex with more equipment deployed in more nontraditional locations, there is a greater need to get it away from the traditional core locations and still keep it stable and safe.

Cautiously Moving Closer to the Edge

Moving to the edge brings data closer to the end user, supporting a range of next-generation devices and solutions and improving overall supply chain manageability and efficiency. However, before bringing your data to the edge, there are challenges that must be considered:

- **Security.** Security is the single most important challenge for any IT space. Since an edge deployment is intended to bring computing power closer to the end user, it's often located in an area accessible by non-IT personnel. Protection—both physical and cyber—must be the first and foremost consideration for any IT deployment, especially at the edge.
- **Latency and Bandwidth.** While keeping data local, an edge deployment will also be a node on a larger network, whether cloud-based or in-house. Sufficient bandwidth capacity must be available to support connectivity back to home locations. Depending on the specific application, latency will also be critical to ensure any data is acted on in a timely manner.
- **Power Distribution.** As data technology evolves, so do the power capacities of edge systems. It is critical to maintain a 100 percent reliable supply of power to all IT components, regardless of installation location.
- **Climate Control.** With power comes heat. An edge system, though a smaller deployment fitting in unique locations, requires a climate control system with sufficient capacity to maintain a stable working environment, even in the most adverse conditions and unlikely installation locations.
- **Redundancy.** Edge deployments collect and process large amounts of critical data. As with latency, the appropriate level of redundancy will accelerate load times while eliminating downtime. An additional benefit of higher levels of redundancy is improved network resiliency and system availability.
- **Growth.** An ever-present challenge, technology is constantly evolving, getting smarter and faster. The edge needs to plan for and manage that growth, with tangible and cost-effective solutions.

Traditional Installation in a Nontraditional Space

Infrastructure and associated hardware must be considered for the edge deployment. This includes enclosures, climate control, power distribution, enhanced monitoring, and security, among other things, but scaled down to a single or limited number of footprints. All are installed without the luxury of a dedicated IT space.

Enclosures, in particular, must meet several criteria to be viable and solve the challenges of an edge data center. As the foundation of an edge installation, the enclosure must meet several unique and demanding installation criteria. These may include enhanced levels of environmental protection, protection against shock and vibration, and, of course, flexibility. Enclosures for IT and network technology need lockable doors and optional electronic locks to provide a log of any access attempt, authorized or not.

Power supplies for IT systems must be designed for the existing production environment. Power distribution hardware must ensure dependable power to active IT components and provide management and monitoring functions to deliver power reliably and effectively. With power comes heat and the need to select the correct climate control system. There is no room for error and the cost of downtime could be significant. Solutions range from ambient air to AC and liquid cooling systems supporting the low to medium installation densities typically found in edge deployments.

Over its lifetime, a typical IT enclosure will undergo a variety of changes and adjustments. In both design and accessories, each enclosure needs flexibility to manage modifications efficiently. This helps ensure the enclosure does not have to be taken out of service or replaced to accommodate new racks, cooling, or power solutions.

For the supply chain as well as just about every vertical market, technology is constantly changing and getting more sophisticated, moving from the legacy data center to the edge.

Before embarking on any new project, have conversations early and often, giving everyone the opportunity to discuss their concerns, offer advice on their areas of expertise, and develop a solution that is appropriate and suitable for everyone. This will support your business, your growth, and your customers—on the edge and beyond. ☺

Getting an Edge on IoT Architecture

IoTNow Webinar

July 16, 2018

1–2 pm, EDT

www.IoTNowwebinars.org

Creative Destruction: An Industry Association Perspective

Although “disruption” has been a buzzword for decades in economics it dates back to Joseph Schumpeter’s 1942 book, *Capitalism, Socialism and Democracy*. In it, he coined the term “creative destruction” to refer to “the incessant product and process innovation mechanism by which new production units replace outdated ones.” He called it an “essential fact about capitalism.”

Applied more broadly, creative destruction arguably has its roots in the works of Karl Marx, Friedrich Engels, and Charles Darwin. Mr. Schumpeter used the term to describe the transformation of the global economy over the 19th and 20th centuries from predominantly agrarian to industrial. Something similar has been underway in the late 20th and early 21st centuries with the transformation of economic infrastructure technology from primarily mechanical to increasingly electronic.

More recently, MIT economist Ricardo Caballero, PhD, described the restructuring process associated with creative destruction in both macroeconomic and microeconomic terms.

“This restructuring process permeates major aspects of macroeconomic performance, not only long-run growth but also economic fluctuations, structural adjustment and the functioning of factor markets,” he wrote. “Over the long run, the process of creative destruction accounts for over 50 percent of productivity growth. Obstacles to the process of creative destruction can have severe short- and long-run macroeconomic consequences.”

At the *microeconomic* level, creative destruction is characterized by countless decisions, which are often complex and involve multiple parties as well as strategic and technological considerations.

“The efficiency of those decisions not only depends on managerial talent but also hinges on the existence of sound institutions that provide a proper transactional framework. Failure along this dimension can have severe macroeconomic consequences,” he reasoned.

“Some of these limitations are natural . . . others are man-made, with their origins ranging from

ill-conceived economic ideas to the achievement of higher human goals, such as the inalienability of human capital.”²

Industries are challenged to forecast what and how the process of creative destruction may visit upon their production, supply chains, employees, investors, distribution channels, and customers. They also must focus on the present by managing challenges that may be manifestations of potentially disruptive creative destruction to their business model.

Creative destruction is visible across numerous sectors: landlines are disappearing in favor of mobile devices; light-emitting diodes (LEDs) are replacing shorter-life incandescent lighting; and factory automation is driving improved productivity in ways that are material to current manufacturing workers.

ASSOCIATIONS REACT

When an industry association and its Members observe creative destruction and market transformation, how should they react?

First, it should heed the observations of economists like Mr. Schumpeter and Dr. Caballero: Do not get in the way of this natural economic phenomenon. Creative destruction will present both losses and opportunities for economic actors in the short run, but generally economic benefits in the long run.

Industry trade associations are typically rule-structured on a foundation based in antitrust and competition law principles that serve as useful guideposts. Collusion to restrict new technology and deprive consumers of their preferences is forbidden. However, legitimate industry collaboration to address technological, economic, and political challenges can help Members navigate the creative storm and emerge in a better position.

Second, the association should take note that, in the words of Dr. Caballero, Members may be preoccupied with making “countless decisions to create and destroy production [and supply chain] arrangements” that “are often complex, involving multiple parties as well as strategic and technological considerations.”

These Members need timely information to understand trends, opportunities, and emerging risks. There is an important role for the association in providing data about:

- Government policies that present barriers or those that create incentives and opportunities
- How and how fast the transformation is occurring
- Technological solutions to problems facing manufacturers, the supply chain, and customers

Continuously engaging with Members to understand their information gaps and working to fill them is an essential association role.

DATA, ADVOCACY, AND STANDARDS

Lighting is arguably the most visible NEMA sector undergoing creative destruction. Not only does market transformation present significant costs for traditional products, production, supply chain relationships, and consumers, but it also provides significant opportunities.

Today's circumstance began nearly 20 years ago when longer-lasting, more efficient fluorescent (CFL) technology became an alternative to incandescent technologies. As governments incentivized energy efficiency, significant quantities of longer-life (5–8 years) fluorescent lamps began occupying more “sockets” once illuminated by shorter-life incandescent lamps (1–2 years). Sales of replacement lamps of the latter steadily declined. Meanwhile, consumer awareness of the value of energy efficiency trended upward. With the economic viability of consumer LEDs established in 2015, longer-life light bulbs of all types occupy an even greater part of the market.

As the industry association for lighting, NEMA was not merely observing this phenomenon. A key question was how quickly the transformation would unfold. New data was needed. NEMA efforts to collect data began in 2012 when more efficient halogen lamps began replacing traditional incandescent ones. While LED lamps had not reached the consumer market by 2012, it was foreseeable that LEDs would be available in consumer channels in the business-feasible timeframe.

Data reporting began for LED lamps even though shipments were miniscule. An index was created that would measure year-over-year quarterly growth. When LED sales began to show significant

growth in 2015, sizable imports of LEDs were part of that growth, yet they were not measured in NEMA reports, nor was the U.S. government capturing them.

NEMA lobbied the government to begin collecting LED import data. Its data, when supplemented with the government's, confirmed that shipments of residential LEDs surpassed shipments of halogen incandescent in 2017 and are poised to capture 60 percent more of shipments in 2018. With estimates of lamp life in residential sockets in hand, manufacturers could (and do) sharpen their estimates of declining lighting products as well as increasing longer-life LED lamps. In turn they can plan the rationalization of their production assets accordingly.

NEMA's advocacy team also recommended government support for cutting-edge research that could make LEDs more affordable more quickly. NEMA advocated for policies that would let consumers and competition lead the transformation, rather than government mandates.

Industry Standards were needed to solve technical issues, meet consumer expectations, ensure a common lexicon, and address safety attributes. In the most dynamic early days of LED market penetration, products became obsolete seemingly within months. Beginning in 2010, several NEMA and ANSI lighting Standards were adopted for LED products or amended to add specifications.

Lighting's creative destruction shows no sign of ending soon. Instead of replacing a light bulb, the consumer may soon replace an entire fixture with embedded light sources with remote or mobile communications connections capable of responding to inputs or transmitting data.

NEMA's three-pronged approach is consistent with the recommendation of Mr. Schumpeter and Dr. Caballero to avoid hindering economic change during a time of creative destruction but to quickly capitalize on opportunities. It also is in line with counting on competition and consumers to drive transformation.

Creative destruction is not limited to lighting. It may be coming soon to all NEMA divisions. ☺

1 Ricardo J. Caballero, “creative destruction,” from *The New Palgrave Dictionary of Economics*, Second Edition, 2008, Edited by Steven N. Durlauf and Lawrence E. Blume

2 Ricardo J. Caballero, “Specificity and the Macroeconomics of Restructuring,” *MIT Press Books*, vol. 1, 2007.

NEMA Member Companies Wade into Water Debate



Members of IIS posed outside the Senate Office Buildings. They are (from left) Joseph Eaves, NEMA; Sheila Quinnes, Rockwell Automation; Joe Rogers, Siemens; John Eddington, Rockwell Automation; Adam Krug, Eaton; and Ron Borowski, Eaton. Photo by Kirk Anderson

Members of NEMA's Industrial Automation Control Products and Systems Section (IIS) took part in a Hill Day where they met with Senate offices who sit on the Senate Environment and Public Works Committee to discuss S 2800, America's Water Infrastructure Act of 2018.

If passed, S 2800 would invest in updating and expanding water infrastructure systems throughout the country. Along with reauthorizing the ongoing work of the U.S. Army Corps of Engineers, the legislation addresses a wide variety of priorities, including clean drinking water, farmland irrigation, flood control, ship navigability, and beach and shoreline maintenance.

NEMA fully supports policies ensuring access to clean drinking water for everyone. This

includes centralized water delivery systems, wastewater treatment facilities, well water, and other groundwater supply systems. Dependable and safe drinking water delivery and control systems, including in rural and disadvantaged communities, should be an integral component of any water infrastructure initiative.

Investment in our water infrastructure is long overdue. Over the last several years we have seen firsthand a wide range of communities struggling to keep pace with repairs and improvements. Congress should include funding for water facilities of all sizes and incentivize them to make improvements related to reliability, efficiency, and safety, all of which are proven to significantly reduce operating and maintenance costs. Investments such as smart motor-drive systems for pumps, smart meters for customers, and advanced control systems reduce costs to customers and improve water quality.

During the meetings, company representatives were able to specifically discuss sections of S 2800 that they support. Members were also able to ask for changes to the bill, such as adding language that would support maritime port electrification at our nation's ports. ☺

Some members of the NEMA High Performance Building Council (HPBC) toured net zero energy sites in Washington, D.C., recently to learn about the advanced technologies that improve energy efficiency in buildings. Pictured here are Joe Howley, GE Lighting; Wayne Stopplemoor, Schneider Electric; Pekka Hakkarainen, Lutron Electronics; Don McComas, Eaton; Suzanne Alfano, NEMA; and facility management personnel.



Committee Relationships in Supply Chain Dynamics

Just as it is no longer reasonable—or even possible—for individuals to live completely independent of one another, the same is true in the standardization world. The sharing of resources, through communications and the exchange of goods or services (including money) between customer and supplier, can be seen in the committees in the International Electrotechnical Commission (IEC) and Technical Advisory Groups (TAGs) in the United States National Committee of the IEC (USNC).

A product committee of the simplest component (e.g., a conductor) can no longer develop the requirements for Standards in its scope in a vacuum. The committee must consider the needs of its customers (i.e., users of the Standard), suppliers, and the sharing of resources.

To that end, the IEC established the System Approach Aspects, a hierarchical concept for use within each committee's Strategic Business Plan (SBP). It encourages committee members to examine their colleagues' committees to determine whether they are customers, suppliers, or other committees. See Table 1.

The rationale for this categorization is that:

- customers need to define their needs and confirm that actions taken satisfy those needs;
- suppliers provide what is needed while understanding the conditions under which the need exists; and
- other committees incorporate functions and components similar to the original committee.

As devices become more complex and integrated with systems that rely on other devices, products perform in roles not originally anticipated. One example is the electronic motor controller, which was developed for industrial applications but is becoming more widely used in home appliances and electric vehicles.

Additional fallout from the increasing complexity of devices and systems involves the components of end products. End-product engineers and committees may focus on the function and not on the potential availability of interconnected components.

Application to TAGs

In the USNC, operation of TAGs typically has focused on developing and submitting positions on IEC documents and activities that reflect the interests within the U.S. only for the products or subjects under the scope of an IEC committee. Now, it is beneficial to establish liaisons between TAGs similar to those in the IEC. This allows communication of new and changing requirements that affect partner committees.

The liaison also enables discussion of proposals to determine if there would be unanticipated impacts on other U.S. colleagues. Furthermore, collaboration would permit concerns on the ability of components to fulfill the needs of the end product or system application given the current parameters employed in developing the pertinent Standard. Ⓔ

Table 1. IEC TC 17 established the following relationships as part of its SBP.

System Committees (SCs) (TC 17 role as customer)	TC 10 Fluids for electrotechnical applications TC 15 Solid electrical insulating materials TC 28 Insulation coordination TC 36 Insulators SC 36A Insulated bushings SC 36C Insulators for substations TC 77 Electromagnetic compatibility TC112 Evaluation and qualification of electrical insulating materials and systems SC 121A Low-voltage switchgear and controlgear	System Committees (TC 17 role as supplier)	SC 32A High-voltage fuses TC 33 Power capacitors and their applications TC 99 System engineering and erection of electrical power installations in systems with nominal voltages above 1 kV AC and 1.5 kV DC, particularly concerning safety aspects
		Other Committees (TC 17 in contact with for technical consistency)	TC 9 Electrical equipment and systems for railways TC 28 Insulation co-ordination TC 42 High-voltage and high-current test techniques

Safety First as Energy Storage Goes Mainstream



With energy storage becoming more popular throughout the United States, building departments are struggling with approving installations of such systems. These same folks are experiencing a bit of a learning curve with understanding this new technology and how these systems fit into the life of a building electrical system.

In response, electrical and fire safety personnel are working with standards such as UL 9540 / 9540A and NFPA 855. These documents put designers and regulators at ease with energy storage installations. Building and planning departments, as well as state governments throughout the country, are working toward removing barriers that hinder the approval and permitting of energy storage systems.

In Colorado, for example, the state senate is working on HB18-1270, which would allow investment and development of investor-owned utilities to acquire energy storage systems to a maximum systems size of 15 MW.

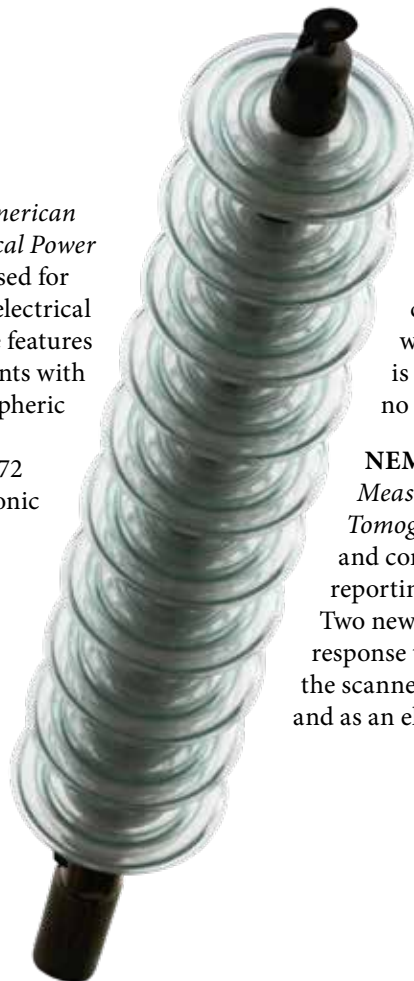
Elsewhere, the New York City Fire Department and the NYC Department of Buildings have been working toward removing barriers related to energy storage. Their concerns focus on thermal runaway in the event of a battery fire cascading out of control, exposing occupants to harmful gases, or the unreleased energy in the storage system creating a hazard for first responders.

Education and standards development will ease energy storage into the built environment. This will make the new technology a more viable option when designing building electrical systems. ☞

Recently Published Standards

ANSI/NEMA C29.1-2018 *American National Standard for Electrical Power Insulators—Test Methods* is used for testing the characteristics of electrical power insulators. This update features changes to the test requirements with regard to sample sizes, atmospheric conditions, and referenced standards. It is available for \$72 in hard copy and as an electronic download at no cost.

NEMA IPDP 1-2018 *Magnet Wire Insulation Removal Methods* is a new white paper that describes methods for removing insulation from finished magnet wire products, including how insulation removal is



achieved, the typical applications for each method, and the safety precautions magnet wire users should consider when conducting magnet wire insulation removal operations. It is available as an electronic download at no cost.

NEMA NU 2-2018 *Performance Measurements of Positron Emission Tomographs (PETs)* provides a uniform and consistent method for measuring and reporting performance parameters of PETs. Two new tests were added to this update in response to developments in the technology of the scanners. It is available for \$108 in hard copy and as an electronic download. ☞

Ann Brandstadter

Manager, Standards Publications and Marketing, NEMA

NEMA Backs Action on China but Questions Tariffs

On May 16, NEMA Vice President for Government Relations Kyle Pitsor testified before a multi-agency committee about proposals by the Office of the U.S. Trade Representative (USTR) to place additional 25 percent tariffs on imports from China of over 100 products of direct interest to NEMA Members' supply chains.

"According to U.S. government trade data, we have estimated the 2017 value of Chinese shipments to U.S.-based electrical and medical imaging manufacturers was approximately \$9 billion, or slightly less than one-fifth of the entire \$50 billion in imports targeted by the proposal," Mr. Pitsor said. "If the tariffs are implemented as proposed, they would represent a tax increase on U.S. manufacturers and their industrial, commercial, and residential customers valued at about \$2.25 billion."

Many U.S. electrical manufacturers either produce their own products in China or source finished goods and components from contractual partners in China as a means to support their U.S. operations. The USTR's proposal would place a

25 percent tariff on more than 100 product types within or adjacent to NEMA scope—as well as many other items that are inputted to U.S.-based manufacturing.

Affected products include everything from electric motors, transformers, and switchgear to LED chips, residential thermostats, arc welding equipment, and medical imaging equipment such as CT, MRI, and x-ray units.

"U.S. electrical and medical imaging manufacturers support an approach that results in fair and open global markets through the application of clear, binding, and enforceable trade rules and compliance with international norms of intellectual property protection," Mr. Pitsor said. "We urge the Administration to consider and pursue alternative measures to bring about the necessary changes in Beijing that result in free and fair trade in our global marketplace."

On May 19, the White House announced that, pending additional negotiations with Chinese officials, it will put off its plans to implement the additional tariffs on Chinese shipments. ☎

NEMA Briefs USMA on Taxes, Tariffs, and Infrastructure

Craig Updyke, NEMA Director for Trade and Commercial Affairs, spoke to the Utility Supply Management Alliance (USMA) annual education conference in Orlando, Florida, in May about the Trump Administration's tax, trade, and infrastructure policy initiatives and implications for electric utilities and suppliers. ☎

I Am the Electroindustry

I have worked as a product engineer and product engineering manager in the wire and cable industry for more than 40 years. During that time, there have been many changes in the design of wire and cable products, caused by the introduction of better insulating materials and new and different wire applications. New and updated Standards are often developed to keep up with these changes.

For example, there has been a need for higher-voltage ac and dc utility cables, combination power and data cables, electric vehicle charging cables, photovoltaic wires, wind turbine power cables, and fiber optic cables.

Regulatory changes also have required redesigns to provide more environmentally friendly cable products. These all need new or revised industry Standards.

Being a Member and chairman of many wire and cable committees for NFPA, CANENA, UL, CSA, ANCE, IEC, and NEMA, I have been involved in and contributed to North American and worldwide wire and cable standard changes. This can be challenging but is worthwhile once consensus has been reached and the Standards are published.

The importance of wire and cable products to the overall electrification system is often overlooked. However, without these wire and cable products there would be no way to power the many electrical machines and home appliances that we consider necessities in our daily lives. Even wireless products need power—and therefore wires for charging the batteries.

I am proud to have been part of the electroindustry and, as such, been part of many of the changes that have taken place.



Sam Friedman, Director of Engineering and Codes and Standards, General Cable

SPOTLIGHT

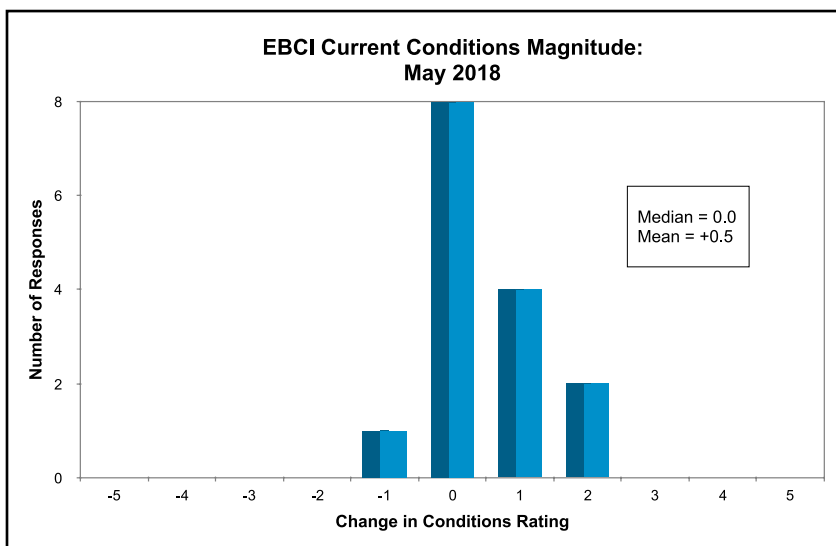
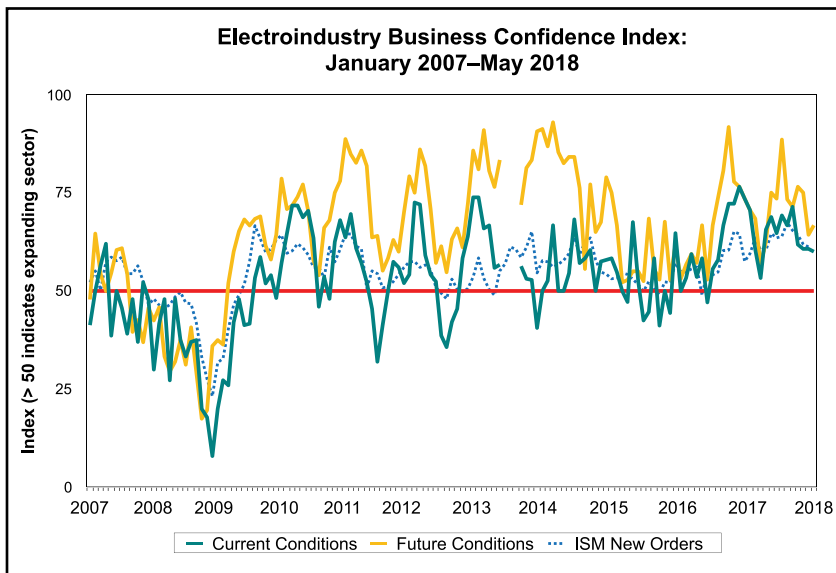
Future Component Sees Modest Bounce

	Current Conditions (Compared to Previous Month)	Conditions Six Months From Now (Compared to Current Conditions)
EBCI	60.0 ▼	66.7 ▲
% Better	27% ▼	53% ▲
% Worse	7% ▲	20% ▲
% Unchanged	67% ▲	27% ▼

Number of Respondents: 15

Values reflect the percentage of respondents expecting "Better" conditions, plus one-half of the percentage of respondents expecting "Unchanged" conditions.

A score of 50 or higher suggests conditions appropriate to an expanding economy.



The current conditions component of the Electroindustry Business Confidence Index (EBCI) remained essentially flat in May, ticking down by a statistically imperceptible 0.7 points from April to a value of 60.0. The EBCI is based on the results of a monthly survey of senior managers at NEMA Member companies and is designed to gauge the business environment of the electroindustry in North America.

The share of respondents that reported better conditions edged down by a slight percentage while those who noted unchanged conditions edged up by a similarly small margin. Panel member commentary largely supported the numerical results, with mostly positive remarks about activity levels shaded by trade and raw material cost concerns.

The reported intensity of change in electroindustry business conditions remained unchanged from last month, with the mean value remaining at 0.5 in May. Similarly, the median value stayed at 0 for the fourth consecutive month. Panelists are asked to report intensity of change on a scale ranging from -5 (deteriorated significantly) through 0 (unchanged) to +5 (improved significantly).

Qualitative input from our panel members about their expectations for conditions six months out was uniformly upbeat, though not overly exuberant, as the future conditions component expanded from 64.3 last month to 66.7 in May. The proportion of responses expecting worse conditions increased substantially compared to last month's results, but the share of panel members who expected better conditions grew by an even larger percentage, thereby lifting the topline number.

Visit www.nema.org/ebci for the complete May 2018 report. 📄

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JUST ANNOUNCED: NEW PRODUCT SHOWCASE

Promote your latest product and service solutions in NEMA's *electroindustry* magazine and amplify your brand to more than 70,000 industry professionals! The upcoming September issue will report on the latest trends and developments from various product sections and will feature a dedicated New Product Showcase for suppliers to participate in. See below for rates and call today to confirm your space reservation.

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