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www.nema.org | January 2018 | Vol. 23 No. 1

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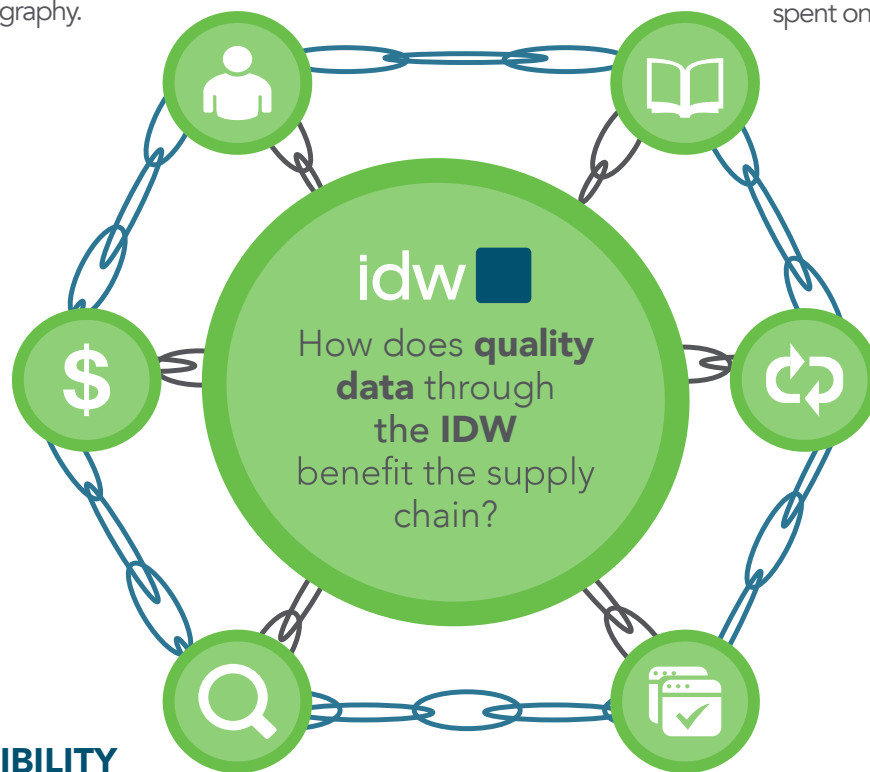
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electroindustry (ei) magazine (ISSN 1066-2464) is published monthly by the National Electrical Manufacturers Association (NEMA), 1300 N. 17th Street, Suite 900, Rosslyn, VA 22209; 703.841.3200. Periodicals postage paid at Rosslyn, Virginia, and additional mailing offices. POSTMASTER: Send address changes to NEMA, 1300 N. 17th Street, Suite 900, Rosslyn, VA 22209. The opinions or views expressed in *ei* do not necessarily reflect the positions of NEMA or any of its subdivisions. The editorial staff reserves the right to edit all submissions but will not alter the author's viewpoint. Every attempt is made to ensure that information is current and accurate.

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Did you know?

As part of the 2018 Strategic Initiatives, NEMA is launching a webinar series on emerging trends in the Internet of Things (IoT). See page 17.

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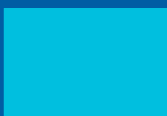
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FROM THE **PRESIDENT**

Eons ago, early humans learned how to control fire. They harnessed it for heating and cooking and discovered it provided lighting. This, along with agriculture, allowed human civilization to begin developing.

From the time of the pharaohs through the 19th century, animal and vegetable oils lit homes. The primary lighting fuel source transitioned to kerosene and natural gas in the mid-to-late 19th century. Subsequently and into the 20th century, Edison, Tesla, and Westinghouse popularized electricity as a brighter, cleaner, and more reliable method for illuminating homes and running businesses. The 21st century sees us entering the third major phase of electricity utilization.

Electricity accounts for 40 percent of the energy we consume in the United States. Three-quarters of that 40 percent is used in residential and commercial buildings for such things as lighting, refrigeration, heating, air conditioning, and the ever-increasing number of electronic gadgets that we have inserted into our lives. The remaining 25 percent is used in the industrial sector, mainly for the motors that drive the machines that drive commerce.

The first electric century brought us electric light, and the second connected the entire country to the grid and made electricity an essential part of our lives, the economy, and society as a whole. The third century will be defined by network-enabled electrical devices and the electrification of direct fossil fuel-consuming industries.

The single-largest user of non-electrical energy is the transportation sector; it accounts for 25 percent of total U.S. energy use. With technological advancements in energy storage, light-duty electric vehicles are on the verge of becoming cost-competitive with internal combustion engines by, if not before, 2030. We are even seeing heavy-duty vehicle electrification, with recent testing and marketing of electric trucks and buses. Similarly, there is every reason to think diesel-electric rail will be supplanted by electricity.

Large-scale electrification of the transportation sector will have a ripple effect throughout the electrical industry. Inevitably, this will increase investments in generation, transmission, distribution, storage, and exponential networking of digital-ready electrical equipment.

The opportunities for increased electrification are not limited to the transportation sector. In residential and commercial buildings, some water and space heating can be converted from natural gas and oil to electric heat pumps and electric resistance heating. In agriculture, advanced lighting and climate control systems used for indoor agriculture can dramatically increase yields and harvests per year. Even some industrial heating processes could be converted to electricity.

Economic and environmental forces will drive the increased adoption of electricity in the 21st century. Whether providing electric vehicle charging stations, LEDs for modern agriculture, or surge-protection devices to protect electrified equipment, NEMA manufacturers will continue to provide the safe, reliable, and efficient products that have characterized the electrical world to date. Excitingly, it will be NEMA Members that develop new and better systems and products that will power the modern connected economy. ⚡

Kevin Cosgriff
President & CEO

NEMA and Industrial Internet Consortium Announce Liaison

NEMA and the Industrial Internet Consortium (IIC) agreed to enter a formal liaison to advance the Industrial Internet of Things (IIoT). A liaison relationship between IIC and NEMA fosters common understanding of new technologies for the digital economy.

According to NEMA Industry Director Steve Griffith, increased connectivity has brought rapid transformation to our industry.

“Standards will need to be iterative and adaptable without delaying innovation,” he said. “NEMA will work closely with IIC to identify and share best practices, align architecture for interoperability, and collaborate on standardization.”

IIC is the world’s leading membership program transforming business and society by accelerating IIoT. Its Liaison Working Group is the gateway for formal relationships with standards and open-source organizations, consortia, alliances, certification and testing bodies, and government entities/agencies.

“We are delighted to collaborate with NEMA on best practices and more for IIoT initiatives supporting electrical and medical imaging manufacturers,” said Eric Harper, senior principal scientist at ABB Inc. and IIC Liaison Officer to NEMA.

“Working together, the IIC and NEMA can ensure that NEMA Members have the information they need to ensure safety, security, and interoperability to maximize the benefits from adoption of the industrial internet across the industries they serve.” ^{en}

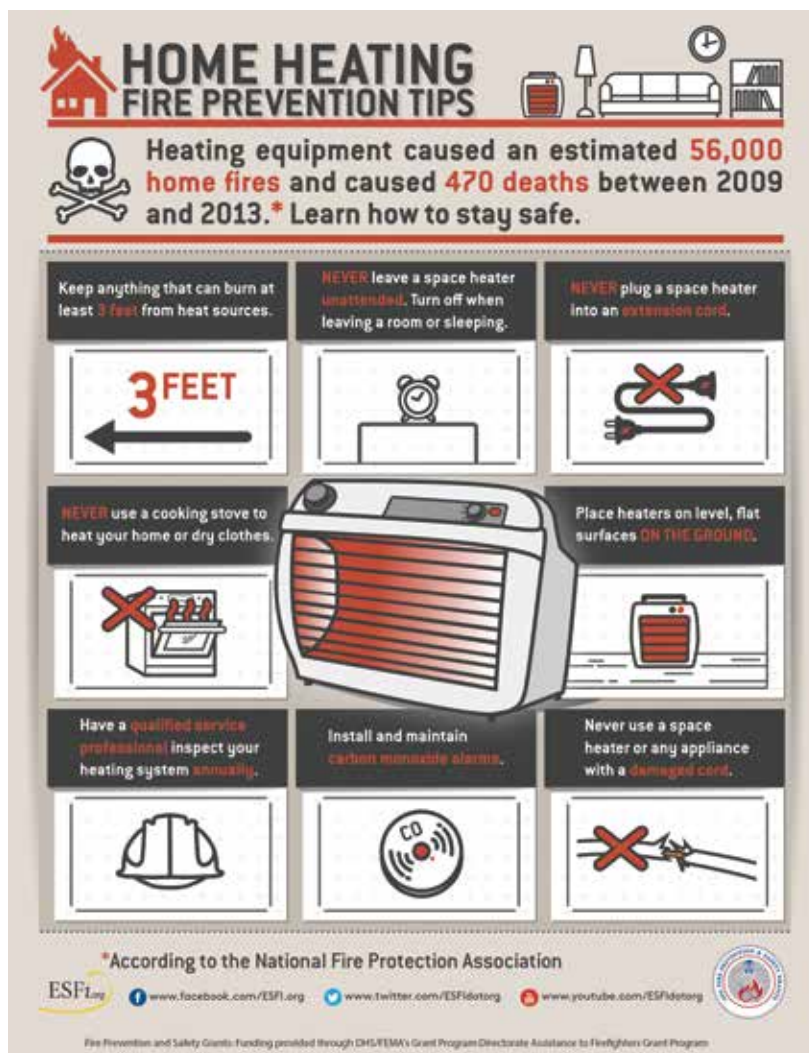
Stay Safe at Home

According to the National Center for Health Statistics, adults 65 and older are 2.4 times as likely as the general population to die in fires. For those 85 and older, the risk is 3.6 times higher. Fires are more common during winter months, in part due to increased use of heating equipment. As the premier nonprofit dedicated exclusively to preventing and reducing fatalities and injuries from fires caused by electricity in the home, school, and workplace, the Electrical Safety Foundation International (ESFI) creates complimentary fire safety awareness materials to assist in educating at-risk populations.

SUPPORT ESFI

Financial donations to ESFI, a Section 501(c)(3) nonprofit organization, promote the development of free resources like the one below. By supporting electrical safety awareness, you help to strengthen a culture of electrical safety in your community, workplace, school, and family. Contributions are a powerful way to show a commitment to electrical safety. Working together, we can reduce electrical fatalities, injuries, and property loss. Explore ways to support ESFI or to co-brand our materials by visiting www.esfi.org or emailing info@esfi.org. ^{en}

Andrea Viñas, Communications Coordinator,
Electrical Safety Foundation International



On the Road to an Electrified Transportation Sector



NEMA Members manufacture the products that generate, transmit, and utilize electricity. Therefore, as electricity use rises, more electrical equipment is needed to meet demand.

There are multiple reasons the pace of electrification should be accelerated: environmental advocates support electrification processes as a way to reduce fossil fuel emissions; electric utilities support increased electricity demand as a way to support business models that rely on investments in new equipment; and electrical equipment manufacturers support switching to electricity, as it results in a way to increase demand for their products.

According to a report by the United States Energy Information Administration (EIA), however, electricity use has been growing at a slow rate when averaged over the last decade as a result of improvements in energy efficiency, increased adoption of distributed energy resources, slowing population growth, and economic shifts toward less electrically intensive industries. While the EIA projects that electricity demand will grow at less than one percent through 2030, its annual outlook depicts a small uptick in electricity demand after 2030 as electricity consumption increases in four sectors: residential, commercial, industrial, and transportation.

Patrick Hughes,
Senior Director,
Government
Relations
and Strategic
Initiatives, NEMA

Steve Griffith, PMP,
Industry Director,
NEMA

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Protecting Capital Assets in the Electrification Era

The new era of electrification is introducing an entire suite of electronic products, sensors, and connected devices that are susceptible to damage from electrical surges, also called transients: electric vehicles are replacing internal combustion engines; space and water heating in buildings can be converted to heat pumps or electric resistance heating; indoor agriculture may boost demand for lighting and HVAC equipment, which may necessitate grid upgrades; and industrial heating and automation can both increase electricity demand.

These complex new circuits and smart devices are driving another necessity for capital asset management: surge protection.

Complex electronic circuits that control the measurement of power (or gas or water) consumption as well as handle smart telecommunications and other functions are vulnerable to circuit threats like transients, electrostatic discharges, and power quality disturbances. Surges or transients can damage, degrade, or destroy the sensitive electronic equipment in offices or businesses, resulting in equipment damage, equipment downtime, lost revenues, and productivity losses due to downtime.

To protect new capital assets in today's increasingly digitized world, robust circuit-protection technologies are essential. Surge protection is a cost-effective solution to prevent downtime, improve system and data reliability, and eliminate equipment damage due to transients and surges for both power and signal lines. It is suitable for any facility or load (1,000 volts and below). Typical applications within industrial, commercial, and residential include:

- Power distribution, control cabinets, programmable logic controllers, electronic motor controllers, equipment monitoring, lighting circuits, metering, medical equipment, critical loads, backup power, UPS, HVAC equipment
- Communication circuits, telephone and facsimile lines, cable TV feeds, security systems, alarm signaling circuits, entertainment center and stereo equipment, kitchen and household appliances

NEMA's Surge Protection Institute offers guidance materials and practical resources designed for engineers, contractors, and inspectors at www.nemasurge.org. 

**Danny Abbate, Industry Director of
Commercial Products, NEMA**

Signs of the Times

Traffic signs have been used as long as man has constructed roads. The Romans popularized mile markers as they interconnected a matrix of roadways across Europe. As traffic increased, so did the amount of information people needed.

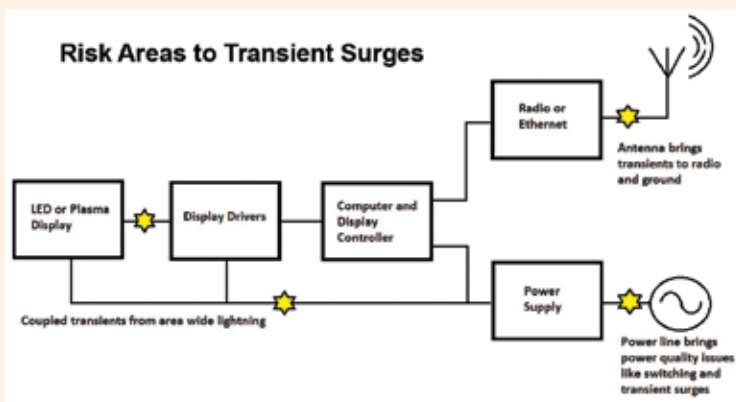
The use of variable message signs (VMS) has significantly increased. Electronically controlled light-emitting diode (LED) or plasma-based VMS are highly visible regardless of weather conditions and provide not only directions and speed constraints but also the capability for moment-by-moment road condition updates. Strategically placed VMS warn travelers about changing road speeds, traffic congestion, road conditions, accidents, and construction. Because these signs are digital and dynamic, state departments of transportation and local law enforcement can remotely change hundreds of signs in seconds.

No matter how helpful they are, the costs of the technology and maintenance are critical. Most states require that VMS have low maintenance and long life (50k+ hours or seven years). LEDs operate by means of microprocessors and digital circuits that create words, graphics, and moving images. The displays require electronic drivers that are controlled by computers that receive data from radio, cell, telephone, and Wi-Fi. The whole system operates on a power supply that converts all incoming ac voltage to dc voltage.

As the diagram below shows, each VMS has at least three critical risk points related to outside induced voltage transient surges and incoming poor power quality. Without proper surge protection, a single cloud-to-cloud lightning strike can couple enough energy to knock out sensitive electronics. There is even more risk to the electronic equipment because it is surrounded by metal that can couple high energy directly into the system. Metal is found in environmentally protective enclosures, mounting equipment, conduit, and cabling that is either copper or aluminum.

Only by designing and installing surge protectors at high-risk areas in the VMS can sensitive electronic equipment survive to predicted life models and create safer highways. ⚡

Ronald Glaser, Senior Power Engineer, Citel Inc.



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While these four all present opportunities for NEMA Members to provide products and services to transition the U.S. to a more electrified economy, transportation represents the best opportunity in the near term. The transportation sector consumes the most energy in the U.S., making up 25 percent of annual energy use, almost all of which comes from petroleum-based fuels. Within this sector, light-duty vehicles (like passenger cars) consume the most energy.

Capitalizing on Opportunities

Electric vehicle (EV) alternatives to internal combustion engine-driven light-duty vehicles have been fully commercialized. They currently account for one percent of U.S. auto sales (four percent in California), and while there are some remaining barriers such as range limitations and the current cost of electric batteries, it is only a question of time before EV sales eclipse conventional automobiles. Looking ahead, we can envision a day when autonomous EVs will chauffeur us around safely and emission-free, refueling wirelessly between rides.

The transportation sector consumes the most energy in the U.S., making up 25 percent of annual energy use, almost all of which comes from petroleum-based fuels.

Electrification of the transportation sector doesn't stop with vehicles. Atlanta's Hartsfield-Jackson Airport has converted a number of its ground-support vehicles from diesel to electric and has installed the requisite charging infrastructure.¹ Ports, too, can be electrified. Some diesel equipment at the Georgia Ports Authority, including ship-to-shore cranes, has been electrified and is reducing emissions and lowering operating costs.²

Through its recently completed 2017 Strategic Initiative on Connected Transportation, NEMA is facilitating electrification across the transportation sector. It will advance the development and adoption of connected, autonomous, and electrified transportation through industry-led standards and guidance, policy advocacy, business information and intelligence, and other areas of industry collaboration to help NEMA Members capitalize on an emerging industry. ⚡

¹ <https://www.southerncompany.com/innovation/electric-transportation.html>
² Ibid.

From Gas to Grid:

How and Where to Build Charging Infrastructure



Excerpted with permission from *Gas to Grid: Building Charging Infrastructure to Power Electric Vehicle Demand*¹

The electric vehicle (EV) revolution is here. We should not allow the fact that EV sales in 2016 were only about one percent of total light-duty vehicle sales in the United States to lull us into a false sense of complacency. There could be 2.9 million EVs on the road in the U.S. within five years, bringing over 11,000 GWh of load to the U.S. power grid, or about \$1.5 billion in annual electricity sales.²

Sticker prices, model options, and range anxiety have long been impediments to EV adoption, but those barriers are set to fall within a few years. Several models already can go more than 200 miles on a single charge. EVs already are cheaper to refuel, and in some cases, such as with high-usage fleet vehicles, they are cheaper to own than conventional internal combustion engine vehicles.

The cost to fuel an EV varies significantly depending on where the vehicle is charged, what type of charger is used, and the utility powering the charger. Where and when EV owners will refuel their vehicles depends largely on where charging infrastructure is installed and the prices that owners encounter, which can vary widely.

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¹ Garrett Fitzgerald and Chris Nelder, *From Gas to Grid: Building Charging Infrastructure to Power Electric Vehicle Demand*, Rocky Mountain Institute, 2017, https://www.rmi.org/insights/reports/from_gas_to_grid.

² Assumes U.S. EV sales growth of 32% per year, 13,500 miles/year, 3.5 mi/kWh, and \$0.132/kWh




Photo courtesy of WEG Electric Corp.

Going Green with Electric Truck Drives

Electric motors and drives specifically designed and hardened for electrification of vehicles is growing well beyond the traditional automotive industry. One example is the first 100 percent electrically-driven light truck developed in Brazil.

The new concept truck will be equipped with an electric powertrain system, consisting of an electric motor that delivers 80 kW (110 horsepower) of output power plus a variable-frequency drive. In addition to the powertrain, the truck will use auxiliary electric motors and drives for an air compressor, hydraulic pump, and air conditioning systems. The project for commercial vehicles also incorporates lithium-ion battery banks providing a range of 200 kilometers, depending on the application and on the vehicle configuration.

The project was introduced to the market by a major vehicle manufacturer to meet the demand for green logistics, zero emissions, and low-noise traffic areas. With a growing use of electric traction systems for buses, trolleybuses, trains, and ships, this delivery truck takes an important step in its growth of electric vehicles in the market for metropolitan use. 

Dale Basso, Product Manager, Low Voltage Motors, WEG Electric Corp.

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The world doesn't need any more cost-benefit analyses; they've already been done, and they show that vehicle electrification has numerous benefits for drivers, utilities, communities, and society as a whole.

What we need now is to understand how and where to build charging infrastructure, and then start building it.

The path that a given utility or state might take to vehicle electrification will vary according to several fundamental factors, such as the regulatory environment, incentives, driving patterns, the grid power generation mix, load patterns on the local grid, climate and social objectives, and various costs.

Passive management techniques, such as time-of-use tariffs, offer a simple and easily implemented way for utilities to use the charging load of EVs to provide dynamic, real-time grid regulation services and to provide a flexible load to meet supply. By using EVs to absorb excess solar and wind, utilities can avoid curtailment of those generators, increase their share of the total electricity supply, and possibly displace or avoid the need for conventional fossil-fueled generation. Utilities can realize these benefits starting now, with each new EV that appears on their grids.

Our message is clear and simple: Building EV charging infrastructure should be an urgent priority in all states and major municipalities. Getting it right will require unprecedented cooperation by many stakeholder groups. The time to act is now. ☺

Next-Generation Charging Stations



Photo courtesy of Hubbell Incorporated

Early expectations for electric vehicles (EVs) and electric vehicle supply equipment (EVSE) indicated a rapidly flourishing market that would take over in a short period of time. Sales of EVs, however, did not meet original expectations. Why? Because the availability, speed, and convenience of EV charging stations were not equivalent to or better than the availability, speed, and convenience of fuel for gas-powered vehicles.

With the rapid growth of battery technology and decreased charging times, however, the EV market has the potential to overtake gas-powered vehicles.

In preparation for this potential disruption, the market needs to be prepared with the proper charging equipment. EVSE needs to be adaptable to meet the diverse needs of users. It must provide flexible installation, communication, and networking options while making sure that the grid is not overwhelmed as a result of this new charging infrastructure.

According to a study conducted by Hubbell of general EV users and classified super users, key elements were extracted from in-person interviews to determine valuable features of next-generation charging stations. They include:

- **Rate of charge**

Larger ampacity EVSE (30A-80A) decreases the amount of time it takes for a car to achieve a full charge. This means less need for overnight charges in order for a car to receive a full charge, getting drivers on the road faster.

- **Charge delay**

This feature allows users to select off-peak times to charge vehicles to save on electricity bills.

- **Amperage selector**

Users can downgrade the amount of power pulled so it can be used in all locations (even where 30A isn't available).

- **Unit footprint**

Slim units fit in a variety of locations and will not interfere with surrounding equipment.

These features have been integrated into the design and structure of some new EVSE units. The insight behind them will accommodate more features as technology advances, creating products that integrate directly with home equipment so users can monitor and speak to their devices to control vehicle chargers.

As the use of EVs continues to grow worldwide, the demand for more efficient EVSE that is appropriate for all users will also rise. ☺

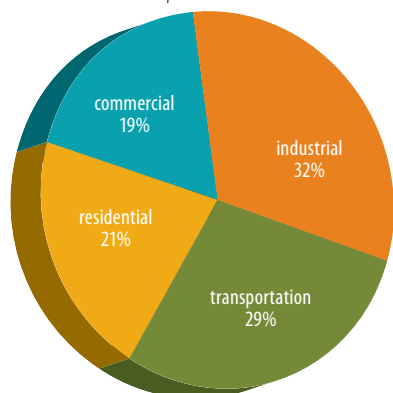
**Benny Thomas, Product Manager,
Hubbell Incorporated**

The electric power sector is changing. From solar panels on neighborhood rooftops to electric vehicles sharing our roads, the evolution toward a more efficient, flexible, interconnected, and customer-centric electricity system is happening.

For more than 40 years, the Electric Power Research Institute (EPRI), an independent, not-for-profit research organization, has examined the long-term technical and reliability needs of the electric power system for the benefit of society. Technological advancements in sensing, computing, and data analytics coupled with the increasing share of renewable and distributed energy resources have led our utility systems to become much more interdependent.

Share of total U.S. energy consumed by end-use sector in the United States, 2016

Total = 97.4 quadrillion British thermal units



Note: Sum of individual percentages may not equal 100 because of independent rounding.
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 2.1, April 2017, preliminary data

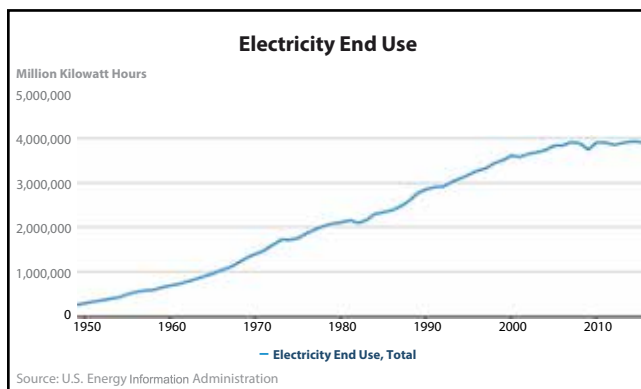
EPRI is examining opportunities to replace higher-emitting and less efficient end-use energy sources with more efficient technologies. This efficient electrification harnesses the benefits of a cleaner electricity generation mix with advanced technology, creating more efficient applications in the home and workplace.

This year, we launched the Efficient Electrification Initiative that will analyze the economic and societal benefits of electrification. The initiative will include national and state-level assessments to better understand where the opportunities are in efficient electric technologies, ongoing R&D and demonstrations of existing and new technologies, and centers of excellence for collaboration on new concepts and ideas.

**Arshad Mansoor,
PhD, Executive Vice
President, Research
and Development,
Electric Power
Research Institute**

Dr. Mansoor is a senior member of the Institute of Electrical and Electronic Engineers and Vice President of the U.S. National Committee of CIGRE, the International Council on Large Electric Systems.

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Assessing Potential for Electrification

Today, end-use energy consumption from electricity accounts for about one-fifth¹ of the nation's total end-use energy consumption. The EPRI assessments will evaluate the major drivers and feasibility of transforming the U.S. energy sector from 2020 and 2050. The results will show energy demand in key sectors and energy production with an emphasis on the electric power sector for a number of scenarios.

EPRI has defined a set of key drivers and scenarios for increasing efficient electrification by midcentury. The drivers are:

- Energy markets (price of natural gas)
- Technological change (nuclear power costs, renewable power costs, renewables, hydrogen production)

¹ Based on U.S. EIA 2016 data, the total primary energy used for end-use energy consumption in the U.S. was ~97.4 quads whereas the total consumption of end-use energy used was ~70.2 quads. The total energy consumption of electricity at end-use in U.S. is ~3,852,769 million kWh (= ~13.13 quads). *Monthly Energy Review*, U.S. Energy Information Administration, <https://www.eia.gov/totalenergy/data/monthly>.



- Consumer preferences (consumer electronics, electric vehicles, indoor agriculture, advanced manufacturing)
- Policies (technology standards, air quality, greenhouse gas regulations)

The scenarios are:

- Technology-driven cases to examine different penetration rates of electric technologies over time (electric vehicles, cooling and heating systems, industrial applications)
- Air emission reduction cases to examine a range of mitigation targets with medium- and long-term reductions
- High renewables, high distributed generation scenarios
- Cost-minimizing cases to explore how different sectors could deploy electric technologies in different regions over time

Electrical Controls Show Affinity for Improving Mechanical Systems



I ncreasing the use of electronics to control mechanical systems allows for a more efficient operation of these mechanical systems. One of the most common applications is to utilize variable-frequency drives (VFDs) in lieu of traditional motor starters to control pump and fan motors. This application provides several positive impacts for the end user. The most advantageous are:

- Energy efficiency
- Operational efficiency
- Building analysis improvement
- Maintenance cost reductions

Energy efficiency is achieved by taking advantage of the affinity laws. These physical laws provide the basis for saving energy for pump and fan applications by maintaining the necessary speed while reducing the mechanical energy needed to do so. The application is achieved by varying the frequency of the motor to slow down the motor to the actual speed needed to maintain the proper output. There have been online calculators developed to provide details on the actual energy savings and the costs associated.

Operational efficiency is another area that can be improved with the expansion of electrical controls. The processing capabilities within VFDs allow for increased laminar flow and the alarming of items such as high currents caused by blockages or other issues associated with setpoints. Better flow control reduces the effect for water hammer during pump starting vs. mechanical methods.

Building analytics provide an opportunity to maximize efficiency. These improvements are created by the integration of more electronic controls and their ability to provide an enhanced level of information to building management systems. VFDs can provide more information via communications instead of adding more sensors or other measurement devices.

Mechanical systems used to control pumps and fans require belts, mechanical flow controls systems such as dampers in HVAC applications, and other mechanical devices. These systems require extended maintenance to provide a continuous level of operation needed by users. The number of these components increases as the systems get larger, thereby increasing the maintenance costs. Reducing the number of these mechanical components provides an opportunity to lower maintenance costs.

The installation of VFDs can increase energy, operational, and overall building efficiency as well as reduce the maintenance needed in mechanical systems using pumps and fans. These cost savings opportunities show the reason we see more electrical systems becoming integrated with mechanical systems. **CE**

Keith Waters, PE, CEM, Manager of Industry Standards, Schneider Electric

Innovative Technology

The Efficient Electrification Initiative expands EPRI's research and development portfolio to explore existing and new innovative technologies. Among them are indoor agriculture, electric transportation, and space conditioning.

INDOOR AGRICULTURE

A source of sustainable food regardless of climate or population density, indoor agriculture optimizes plant growth using electric lighting, thermal, and sensing controls. The technology offers year-round production that improves utility grid utilization. It also enables matching hydroponic plants with aquaculture fish farming. Another benefit is that it reduces water consumption for plant growth by up to 90 percent. It will also reduce average food miles—the distance produce must travel to a destination.

ELECTRIC TRANSPORTATION

The personal transportation sector is at an inflection point as consumers increasingly seek cleaner vehicles that are cheaper to power and maintain. In 2017, Volvo announced that starting in 2019, all of its cars will use either hybrid, plug-in, or pure battery-electric drivetrains. India, Norway, France, and Britain² have pledged to go all-electric as early as 2040. This transition has been facilitated by advancements in energy storage and composites.

The demand for electric forklifts is increasing as a replacement for traditional forklifts that use propane, diesel, or gasoline. Advances in electric forklift motor drive, battery, and charger technology have dramatically improved equipment performance. Approximately 64 percent of the total North American forklift market and more than 70 percent of the European Union forklift market are now electric. Electric forklifts offer equal or superior performance and significant cost savings, and their use reduces on-site emissions, such as carbon monoxide and noise.

SPACE CONDITIONING

Next-generation heat pumps and commercial variable-capacity rooftop heat pumps (VCRTUs) are highly efficient heating and cooling systems that are suitable for many residential and commercial building applications. They deliver comfort similar to that provided by fossil fuel forced-air systems at an even greater efficiency than traditional heat pumps.

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² Alanna Petroff, "These countries want to ditch gas and diesel cars," *CNNMoney*, July 26, 2017, <http://money.cnn.com/2017/07/26/autos/countries-that-are-banning-gas-cars-for-electric/index.html>.



Photo courtesy of Stelpro

Achieving Savings with Smart Thermostats

Electric heating is an efficient way to heat a home because every watt consumed is transformed into heat. Electrical zone heating allows occupants to be more comfortable and save energy because each room is heated only to its specific needs.

Electronic line voltage thermostats provide comfort and energy savings by providing more precise readings and less temperature variation. A smart line voltage thermostat allows the user to save up to 25 to 30 percent compared with a mechanical thermostat and save 12 to 16 percent compared with an electronic thermostat.¹

The savings of using a smart line voltage thermostat come from:

- geofencing, which enables automatically lowering the setpoint when no one is home;
- creating activities based on a user's busy schedule, not the typical four activities per day repeated every day;
- grouping some rooms that have the same behaviors (bedrooms, basement, bathrooms, kitchen) to optimize the benefits of zoned heating;
- sending alerts if something is unusual (such as an open window alert); and
- consumption reports that make users more aware of their energy footprint.

A smart thermostat also changes users' behaviors, making them more aware of what is going on and providing them with the power to act. 

**Sergio Marques, Product Manager,
Controls and Cables Division, Stelpro**

¹ Stelpro worked with École Polytechnique de Montréal (the University of Montreal's Engineering School) on a study to compare the energy consumption between line voltage mechanical thermostats, electronic nonprogrammable thermostats, and a smart thermostat. The tests were for a typical Montreal winter, heating from October 15 to April 30. The study used the reference twin houses of the Canadian Centre for Housing Technology located in Ottawa; the houses feature more than 250 sensors and 23 energy meters.



Continued from page 11


A rooftop unit typically has the indoor and outdoor components of a heat pump packaged together in a single unit located outdoors. Unlike standard-efficiency heat pumps, which operate at a fixed output, VCRTUs use inverter compressors to provide continuously variable output to more closely match a building's heating and cooling demands. Systems can provide heat output at ambient temperatures as low as 0°F. VCRTUs are well-suited for low-rise buildings (up to three stories) with ductwork, including strip malls and stand-alone retail centers, grocery stores, restaurants, and office buildings.

Electrification and Manufacturers

Electrification has the potential to reduce air and water pollution; improve energy efficiency; offer customers the opportunity for gains in productivity and product quality; and improve environment, health, and safety for workers. Identifying a specific electric technology with the potential for emissions reductions involves technology screening and assessment of the realistic potential for customer adoption.

National and state-level assessments coupled with R&D of enabling technologies are key to understanding the opportunities and the potential of expanding market adoption of electric technologies. The success of increased adoption of efficient electrification technologies depends on many factors, such as state and federal regulations, the availability and price points of new and innovative electric technologies, and the culmination of R&D in the commercialization of electric technologies that have high potential for reduced greenhouse gas emissions.

Manufacturers are crucial to the acceleration of electrification. The successful penetration of electrification hinges on manufacturers' ability to sustain and deliver new and innovative electric technologies to consumers. There are examples that show how collaboration between manufacturers and utilities, research entities, and stakeholders has aided in increased customer awareness and outreach, improving the adoption of electric technologies.

One example is Georgia Power's Customer Resource Center, which actively demonstrates several technologies for its customers. Several manufacturers have loaned equipment to this center so that customers can experience the technology first-hand and understand how it can benefit their processes as well as improve their economic and environmental positions. 

EPRI is hosting the inaugural Electrification 2018 conference August 20-23, 2018, in Long Beach, California, to bring together commercial and industrial markets, R&D and academic communities, state and federal policymakers, and other stakeholders to discuss the impact and benefits of a more electrified economy. Manufacturers are invited to participate.

Learn more at www.electrification2018.com.



Photo courtesy of Pentair

Electrification Improves High-Rise Hot Water Design

New York City is a city of modern, energy-efficient, and increasingly narrow skyscrapers. This is driving engineers to innovate their system designs to bring more services up to greater heights while simultaneously saving energy and space.


Plumbing codes require potable hot water to be maintained at a minimum delivery temperature by either recirculating the unused water back to the water heater or utilizing electric temperature maintenance systems. Traditional plumbing system designs place independent heaters and recirculation piping systems in each pressure zone (approximately every ten floors).

A hot water temperature maintenance self-regulating heating cable system is an electric technology alternative to recirculation pump methods.

Bruce Jaffe, a principal at MG Engineering, rethought the standard potable domestic hot water generation and distribution by utilizing electric temperature maintenance hot water heat trace cable in lieu of the industry standby recirculation pump method for plumbing code compliance. MG Engineering's innovative designs result in cost-efficient construction and reduced mechanical shaft requirements, mechanical and electrical room space, building fuel use and greenhouse gas emissions, and water waste—all while supplying instant hot water for building tenants.

According to Mr. Jaffe, electric temperature maintenance cable systems decouple the zone pressure from the water heater pressure.

"This permits us to create a master hot water plant, which minimizes overall space and BTU requirements. The system is simplified by eliminating equipment and its associated installation requirements," he concluded.

By replacing inefficient recirculation plumbing technology with cost effective and energy saving electrical heat tracing technology, tenants get instant hot water, no matter how loaded or unloaded the building is, and that's all they need to know. 

David Shepard, PE, President, G.A. Fleet Associates, Inc.
Bob Silva, Raychem Marketing Manager,
Pentair Thermal Management

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Artificial Intelligence Solutions for Transportation

The latest applications of artificial intelligence (AI) technology in the fields of defense intelligence, medical imaging, smart cities, finance, and cybersecurity were on display in Washington, D.C., in November. Hosted by NVIDIA, an American technology company that designs graphics processing units (GPUs) for the gaming, cryptocurrency, and other markets, NVIDIA's GPU Technology Conference attracted more than 1,500 attendees from government, Congress, the military, research institutes, and the private sector.



Police can track criminals using technology that recognizes faces and license plates. Photo by Shuyu Zheng

One platform for accelerating the adoption of autonomous driving combines deep learning, sensor fusion, and surround vision technologies to capture real-time surroundings, precisely locate a vehicle on a highly detailed map, and guide the vehicle on a safe path. The platform captures the data from multiple camera, lidar, radar, and ultrasonic sensors and then uses algorithms to understand and present the environment around the vehicles, including static and dynamic objectives. Deep neural networks that detect and classify objects can make the fused sensor data even more accurate. The platform is designed to support ASIL-D, the highest level of automotive functional safety as defined by ISO 26262 *Functional Safety for Road Vehicles*.

Other systems promote safety and smart cities. Police can use the technology to recognize faces and license plates to identify criminals on the loose. The platform in the car, coupled with GPUs in the data center, can create highly detailed maps and keep them updated for automakers and map companies. The platform can also send back traffic condition data to help alleviate congestion. Cooperating with Huawei Technologies, NVIDIA used this technology to ease the congestion in Shenzhen, China, by 30 percent.

With its futuristic possibilities, AI technology creates abundant opportunities for electrical manufacturers while setting higher requirements for electrical equipment and devices. ☼

SPOTLIGHT



Mariela Echeverria, Communication Services Manager, NEMA
Photo by Pat Walsh

I Am NEMA

As the communication services manager, I provide marketing communication services to NEMA sections, promote programs and initiatives, and manage social media platforms. My background in commercial real estate, consulting, and the energy sector allows me to bring a well-rounded perspective to my work with these different groups.

Fascinated by the ever-changing world with its new trends and tools, I believe it's important for organizations to adapt to innovation not only in technical products but also within the company structure itself. Since starting at NEMA in September, I joined the NEMA Innovation and Improvement Initiative (I3) team, which is dedicated to modernizing NEMA/MITA and creating a more productive and effective organization for the future.

I am excited to be a part of NEMA's growth and its journey of electrification. ☼

Developing an Energy-Efficiency Workforce




Briefing Congress on the need for an energy-efficiency workforce were (from the left) Jonathan Stewart, NEMA; Lauren Asplen, BlueGreen Alliance; Liz Delaney, Environmental Defense Fund; and Daniel Bresette, Alliance to Save Energy. Photo courtesy of Alliance to Save Energy

On October 26, NEMA Government Relations Manager Jonathan Stewart participated in a panel briefing of U.S. House and Senate staff on workforce development. “Developing the 21st Century Energy Efficiency Workforce” was hosted by the Alliance to Save Energy and also included panelists from the BlueGreen Alliance and the Environmental Defense Fund.

Congressman G.K. Butterfield (D-NC) keynoted the session and spoke about the need for government and industry collaboration to


address workforce gaps. Mr. Stewart highlighted NEMA’s 2018 Strategic Initiative for Workforce Development, which includes components of industry promotion, apprenticeships, and community college curriculum sharing.

For more information about the event or NEMA’s Workforce Development Strategic Initiative, contact Mr. Stewart at jonathan.stewart@nema.org. 

Updating SF₆ Reporting Requirements

NEMA Government Relations Manager Jonathan Stewart discussed sulfur hexafluoride (SF₆) emissions and pending rule changes to state reporting requirements related to it with a group of utilities in Tampa, Florida, in November.

SF₆, a highly potent greenhouse gas that has a global warming potential thousands of times greater than carbon dioxide, is used in the electrical sector to insulate medium- and high-voltage transmission and distribution equipment against electrical arcing.

In California and Massachusetts, utilities are required to report annual SF₆ emissions and face potential fines if those emissions exceed a specified threshold. California is preparing to update its rule to allow greater flexibility for reporting entities to track and report actual (instead of estimated) emissions. 



Nameplate adjustments is one solution to SF₆ emission-reporting challenges. Photo by Karla Trost, G&W Electric

Briefing Congress on Rebuilding Puerto Rico



Anna Pavlova, Schneider Electric (left), and Asaf Nagler, ABB, were among manufacturers and lawmakers who discussed solutions for rebuilding Puerto Rico's electrical grid.

On November 30, Puerto Rico's resident commissioner, Jenniffer González-Colón, kicked off "Rebuilding Smart, Exploring Ways to Rebuild the Electrical Grid After a Disaster," a congressional briefing hosted by NEMA where members of Congress and electroindustry experts examined viable solutions for and policy hurdles in disaster reconstruction.

"Puerto Rico needs to get people and businesses back to work, and able to withstand future disasters, or there will be no lasting recovery," said Representative González-Colón. "To properly rebuild, it is necessary to change the vision of policies like the Stafford Act, so that mitigation of future risk and built-in resilience are required to be a part of the recovery effort."

Representative González-Colón was joined by Reps. Nydia M. Velázquez (D-NY) and Marcy Kaptur (D-OH), all of whom are co-sponsors of HR 4251, the Rebuilding Resilient Energy Systems Act of 2017.

"Puerto Rico must use the catastrophe of recent hurricanes as a catalyst for change. Building a sturdy and innovative grid that uses renewable energy is the best investment the government can make," added Representative Velázquez, a ranking member of the House Small Business Committee. "We cannot repeat the same mistakes of the past."

NEMA Members Schneider Electric and ABB Inc. joined as panelists in the briefing. Schneider Electric proposes public-private partnerships for a series of community and critical facility microgrids that would augment reliability of the main grid with islanding capabilities for prolonged outages. ABB states that building a resilient electrical grid is possible with already developed technologies and that repair and rebuilding funding should allow flexibility to deploy existing grid solutions that increase grid resiliency.

The NEMA staff of engineers and electroindustry experts provided lawmakers and Puerto Rico's officials with recommendations and guidance documents for a more robust approach to electrical preparedness and recovery. The Storm Reconstruction Toolkit, available in both English and Spanish, outlines how today's technologies can provide safer, more reliable, and more resilient power systems that can be restored quickly following a disaster. Learn more at www.nema.org/storm-disaster-recovery. ☎



Representatives (left to right) Nydia M. Velázquez, Marcy Kaptur, and Jenniffer González-Colón co-sponsored HR 4251, the Rebuilding Resilient Energy Systems Act of 2017, which addresses rebuilding the electrical grid in Puerto Rico.

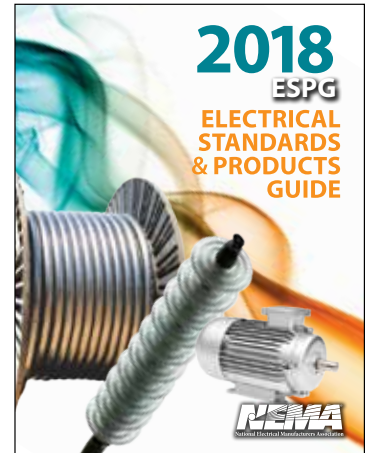
Photos by Patrick Hughes

New Standards and Products Guide Now Available

The 2018 *Electrical Standards & Products Guide* (ESPG) is now available for download. This edition features updated prices and more than 10 new standards and white papers. ESPG lists all NEMA standards and other publications as well as sales contact information for hundreds of electrical manufacturers, arranged by product type. ESPG 2018 can be downloaded from the NEMA website at www.nema.org/espg.

Recently published standards include:

- ANSI/NEMA C29.8-2017 *American National Standard for Wet-Process Porcelain Insulators—Apparatus, Cap and Pin Type* covers materials, dimensions and characteristics, marking, sampling, inspecting, and testing of wet-process porcelain. It is available in hard copy for \$63 or as an electronic download at no cost.
- ANSI/NEMA C29.9-2017 *American National Standard for Wet-Process Porcelain Insulators—Apparatus, Post Type* covers materials, dimensions and characteristics, marking, sampling, inspecting, and testing of wet-process porcelain insulators apparatus (post type). It is available in hard copy for \$56 or as an electronic download at no cost.
- ANSI/NEMA C29.10-2017 *American National Standard for Wet-Process Porcelain Insulators—Indoor Apparatus Type* specifies the materials, dimensions, and performance requirements for indoor apparatus wet-process porcelain insulators. It is available in hard copy for \$56 or as an electronic download at no cost.
- ANSI C136.45-2011 (R2016) *American National Standard for Roadway and Area Lighting Equipment—Aluminum Lighting Poles* includes nomenclature, dimensional data, and performance criteria. It is available in hard copy or as an electronic download for \$69.
- ANSI C137.0-2017 *American National Standard for Lighting Systems—Lighting Systems Terms and Definitions* is a new standard that provides definitions that are directly related to lighting systems and are used in multiple lighting system standards. It is available in hard copy or as an electronic download for \$32. ☎



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NEMA Responds to California Wildfires



Wildfires continue to ravage parts of Southern California, including the Thomas Fire that recently was ranked as the state's second-largest on record. More than 1,000 homes and other buildings have been destroyed and about 18,000 structures remained threatened as a result of unseasonably dry conditions. At the peak of what was termed the October Fire Siege in Northern California, 21 major wildfires forced the evacuation of some 100,000 people, causing 42 fatalities and record-setting property damage.

Through the California Office of Emergency Services (Cal OES) Disaster Service Worker program, I assisted with fire damage assessment in the Napa County fires. Although the Cal OES program is mainly focused on earthquake damage assessment, the fire damage was so severe that local building officials requested its help. With about 30 field personnel involved, it took three days to complete the assessment.

Unlike flood damage, where many structures can be repaired after waters recede, most structures in the path of a wildfire are either unscathed or completely destroyed; few are partially damaged. Of the 40-plus properties that my inspection



An electric sedan, left plugged in and abandoned by fleeing Napa residents, was completely destroyed by the wildfire's radiant heat. Photo by Mike Stone

partner and I posted as unsafe, only two were partially damaged; the rest were total losses.

I distributed and explained NEMA's *Evaluating Fire- and Heat-Damaged Electrical Equipment* to inspection personnel and forwarded it to damage assessment teams in other areas.

Electrical problems ranged from the effects of radiant heat to gasoline availability:

- The most common electrical damage in structures that survived was from radiant heat. Some exterior walls appeared intact, but cable inside the walls was damaged.
- Some residents whose structures survived were without power because the utility distribution infrastructure was destroyed. Many of them connected portable generators to their electrical systems to keep systems and pumps running. This was a real concern with numerous utility crews restoring power in the area. Improper generator connections can pose a backfeed hazard to line workers. We briefed inspection teams on what to look for to verify that the temporary connections were safe.
- Gasoline was scarce. Some gas stations ran out of gas from people filling up as they evacuated. Others were without power and unable to pump the gas that they did have. Combined with road closures, some rural residents found themselves 20 to 40 miles from the nearest gas.

As often happens after natural catastrophes, officials will likely take a closer look at building codes to see if any revisions would lessen the impact of future events.

NEMA will continue to offer assistance necessary to ensure that communities can rebuild safe, smart, and resilient.

Download *Evaluating Fire- and Heat-Damaged Electrical Equipment* (*Evaluación de equipo eléctrico dañado por fuego y calor*) on the NEMA website. 📄

NEMA Advancing Import Compliance, Enforcement

Building on a successful roundtable meeting in September between U.S. Customs and Border Protection (CBP) and NEMA Members, NEMA is developing a publication to help electroindustry manufacturers, including importers, achieve and maintain compliance with U.S. laws and regulations. A central element of the publication, expected next month, will be guidance on how companies should interact with CBP and regulatory agencies, such as the U.S. Department of Energy (DOE), to assist the agencies in enforcing federal laws directed at noncompliant imports.

DOE officials also participated in the September 22 roundtable meeting, held as part of the association's Strategic Initiative on Import Compliance and Enforcement. A spring 2017 survey of NEMA Members conducted under the initiative indicated persistent concerns among Members about the regulatory as well as intellectual property rights compliance of some imported products.

A key takeaway from the meeting was that if CBP can have a greater understanding of how trusted importers do business, the agency is better able to target noncompliance.

NEMA will remain engaged with CBP and DOE as the agencies develop plans to improve their collaboration on import compliance and enforcement.

Another outcome of the initiative has been to place NEMA in a more formal advisory role. In addition, NEMA began service in November on the External Engagement Committee of the Border Interagency Executive Council (BIEC). Chaired by the Department of Homeland Security, the BIEC serves as an advisory board to assist federal agencies with coordination across customs, transport security, health and safety, sanitary, conservation, and trade agencies "to measurably improve supply chain processes and the identification of illicit and non-compliant shipments," according to the BIEC. ☎

North American Electroindustry Recommends NAFTA Modernization

On November 13, NEMA joined its industry counterpart organizations in Canada and Mexico in issuing recommendations for the modernization of the North American Free Trade Agreement (NAFTA).

Cámara Nacional de Manufacturas Eléctricas (CANAME) of Mexico, Electro-Federation Canada (EFC), and NEMA urged their respective governments to update NAFTA in ways that increase market access, reduce business costs, and materially improve the global competitiveness of North American electroindustry companies and workers. The full recommendations are available on the NEMA website (www.nema.org/nafta-recommendations).

"The U.S., Canada, and Mexico have a great opportunity to upgrade NAFTA for the 21st-century economy," said NEMA President and CEO Kevin J. Cosgriff. "Our shared recommendations aim straight in that direction, and we will continue to work with the governments to reach consensus on our objectives."

Negotiations to update NAFTA were launched at the urging of the U.S. in August 2017 and are currently scheduled to conclude by the end of March 2018, although they could continue beyond that date. ☎



NEMA Heads to Colombia for Trade Mission



Colombia, the fourth largest South American market for United States exports of NEMA-scope products (approximately \$191,000,000 in 2016) and the largest South American market that relies on a U.S.-type electrical infrastructure, is the destination for a 2018 trade mission for NEMA Members.

NEMA staff will be coordinating and leading this trade mission. It is a great opportunity for NEMA Members to meet potential clients, distributors, agents, and joint venture partners. NEMA will

again rely on the Department of Commerce Foreign Commercial Service for its excellent Gold Key Matching Service.

The five-day proposed schedule includes business meetings in Bogotá and Medellín as well as energy sector meetings with Colombian government officials.

To take advantage of this great opportunity, contact Jonathan Stewart (jonathan.stewart@nema.org). ☎

Current Conditions Upstaged by Future Conditions

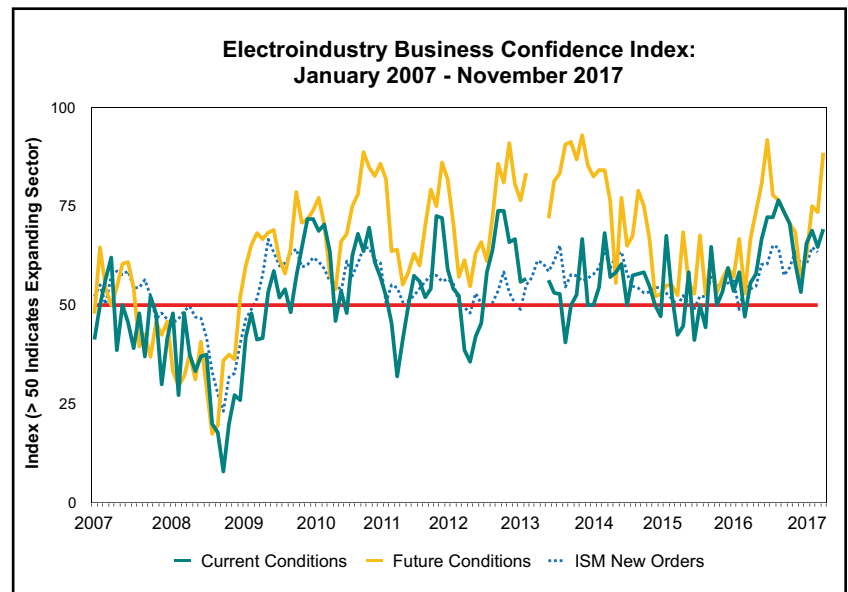
Confidence in the electroindustry, as measured by the Electroindustry Business Confidence Index (EBCI), edged up in November as the share of respondents that reported worse conditions dropped. The overall current conditions component increased from 64.7 to 69.2. A nearly 10-point decline in the percentage of respondents noting worse conditions drove the increase in the top-line measure.

The reported intensity of change reflected the ambivalence of the current conditions component. The median value moved from 0 in October to 1 in November, but the mean declined from 0.7 to 0.5 in November. Panelists are asked to report intensity of change on a scale ranging from -5 (deteriorated significantly) through 0 (unchanged) to +5 (improved significantly).

In October, the proportion of the panel that expected worse conditions matched those expecting unchanged conditions. Although these responses matched up again in November, they dropped by nearly 10 points from their October levels. These declines boosted the share of respondents expecting better conditions. The net result of that shift in expectations moved the future conditions component from 73.5 in October to its current reading of 88.5.

The indexes are based on the results of a monthly survey of senior managers at NEMA Member companies and are designed to gauge the business environment of the electroindustry in North America. Visit www.nema.org/ebci for the complete November 2017 report. 📄

	Current Conditions (Compared to Previous Month)	Conditions Six Months from Now (Compared to Current Conditions)
EBCI	69.2 ▲	88.5 ▲
% Better	46% ▼	85% ▲
% Worse	8% ▼	8% ▼
% Unchanged	46% ▲	8% ▼



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