

# electroindustry

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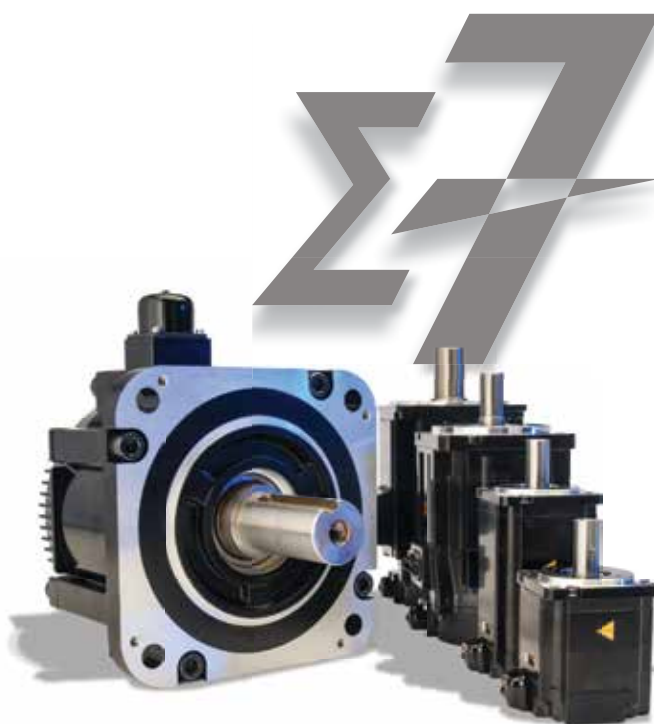
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## FROM THE **PRESIDENT**

**T**he theme of this month's issue of *electroindustry* made me wonder why it is taking cities so long to become smart. We are inundated with declarations about marvels at hand, but the average American still spends 42 hours a year in traffic and is without power for more than three hours a year. So where are these so-called smart cities?

Unlike the dramatic advancements that defined the post-World War II boom, today's urban model is defined by incremental changes in bytes, not miles of concrete. Nonetheless, we are moving unceasingly toward the interconnection of the things that make up cities: buildings, the electric grid, transportation systems, hospitals, and more.

In urban settings, smart buildings hide in plain sight. The neighborhood around the NEMA headquarters increasingly boasts modern buildings, where evidence of Member companies' products adds cutting-edge dimensions of usability and efficiency. Daylight management and other lighting enhancements, integrated emergency systems, and environmental conditioning control improvements are increasingly the norm. In the not-so-distant future, simple wearable devices may create personalized links between workers and their individual workstations.

These same buildings interact constantly with the electric grid, providing real-time demand response, energy storage, and distributed generation services to the macro grid, as well as to each other with local energy transactions—sometimes facilitated by microgrids and documented on a blockchain ledger. They may be surrounded by smart LED street lights that also serve as Wi-Fi hotspots, collect air quality data, identify parking spots, and alert police officers to nearby problems.

GPS devices and smartphones facilitate transportation by communicating constantly with localized traffic information systems to alert drivers to jams, mishaps, and other slowdowns and to reroute drivers in real time.

Healthcare is smarter, too. Modern medicine has been transformed by medical imaging largely because of interconnectivity. A high-fidelity image can be shared worldwide in seconds, allowing diagnosis and treatment decisions in a collaborative and dynamic fashion. The NEMA/MITA-managed Digital Imaging and Communications in Medicine standard (DICOM) makes this possible.

In essence, a smart city is simply the application of the Internet of Things to urban subsystems. NEMA Member companies have been making the “things” of the electrical world for over a century and are now incorporating more products into system arrangements. This step is not without friction—cybersecurity for internet-connected systems is an ongoing challenge—but our industry is at the forefront of changes that will affect our society almost as fundamentally as the original electric revolution.

Whether we notice them or not, the changes are real and ubiquitous. NEMA will continue its work to promote public investment in intelligent and energy-efficient systems as part of any infrastructure renewal effort. Not surprisingly, NEMA Member companies are integral to these improvements. 🌐

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## Revving Up Cybersecurity, Measuring Performance

NEMA's Transportation Management Systems and Associated Control Devices Section (3TS) is completing one project just as another starts.

NEMA TS 8 *Cyber and Physical Security for Intelligent Transportation Systems (ITS)*, which will be published later this year, is designed to allow agencies and other infrastructure owners and operators to implement cyber- and physical-security attributes in legacy and new ITS systems.

The standard, currently in the balloting process, addresses security in the areas of physical, local access, communications (between field and central system), and central system. It also identifies potential threat vectors, the severity of threat consequences, prevention and mitigation techniques, and methods to effectively rate security performance.

The new project involves developing guidance on performance measures, which evaluate the effectiveness and value of projects designed to improve traffic flow or mitigate traffic congestion. As identified in a U.S. Department of Transportation (DOT) Federal Highway Administration (FHWA) Notice of Proposed Rulemaking (NPRM), performance measures would be used by state DOTs and metropolitan planning organizations to evaluate progress in mitigating congestion or improving traffic flow.

The NPRM summarized stakeholder input from previous FHWA rulemaking efforts, categorizing inputs according to speed and traffic flow, spatial and temporal extent of congestion, system throughput efficiency and vehicle occupancy, travel time, and accessibility and trip generation.

For further information, contact Jean Johnson at [jean.johnson@nema.org](mailto:jean.johnson@nema.org).

**ELECTRIC SHOCK DROWNING**  
UNKNOWN DANGER LURKING IN THE WATER

Docks and boats carry sources of **electricity**. Faulty wiring or the use of damaged electrical cords and other devices can cause the surrounding water to become **energized**. NEVER swim near a marina or a near a boat while it's running.

There is **no visible warning** to electrified water.

Electric current in the water causes the **paralysis of muscles** which results in **drowning**.

The 2017 NEC now **requires** marinas and boatyards to have **ground-fault protection** to help prevent water electrification. Check to see if your marina, and the boats in the marina, have proper **GFCI protection**.

As little as **10 milliamps**, 1/50th the amount used by a 60 watt light bulb, can cause **paralysis** and **drowning**.

**WHAT TO DO IF YOU SEE ELECTRIC SHOCK DROWNING TAKING PLACE**

- Turn power **off**
- Throw a **life ring**
- Call **911**
- NEVER enter the water**

**WARNING** – POTENTIAL SHOCK HAZARD: ELECTRICAL CURRENTS MAY BE PRESENT IN THE WATER

The 2017 National Electrical Code **requires** marinas and boat docks to post electric shock **warning signs** where electricity is used **near water**.

**MAY IS NATIONAL ELECTRICAL SAFETY MONTH**

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## Lighting Division Names New Leaders

At its April division and section meetings, the NEMA Lighting Division announced new leadership.

Robert Hick of Leviton passed the chairmanship of the Lighting Systems Division to Chris Holstein of Universal Lighting Technologies. Robert Nachtrieb of Lutron Electronics became the new division vice chair.

Guy Benjamin of Thomas and Betts, a member of the ABB Group, is vice chair of the Emergency Lighting Section, and Steve Irving of Lutron Electronics is vice chair of the Lighting Controls Section.



# Transportation Transformation: Driving the Autonomous Future

Steve Jobs introduced the iPhone just over ten years ago, calling it a “revolutionary and magical project”—a description that is difficult to dispute today.

In merely a decade, we went from using phones for actual phone calls to using them as personal computers for services as varied as email, audio and video streaming, social media, video games, and digital wallets. You name it, a smartphone does it. The impact this one device has had on our lives and methods of communication cannot be overstated.

A similar transition is underway in the transportation sector, though on a larger scale and perhaps in less predictable ways. Some of the same technological developments that made the smartphone possible will help create the connected transportation ecosystem of the future, and the two will be intertwined.

The transformation has already begun, with services such as Lyft and Uber allowing for door-to-door transportation service through a smartphone app. In some cities, these services have already become indispensable. When the fleets of such services become autonomous, they will likely work in tandem with existing transportation options, acting like additional subway lines or replacing certain bus routes.

When autonomous vehicles (AVs) are on the roads, apps on your mobile phone will connect you to not only your modes of transportation but also your personal preferences while you are in transit. You'll be able to order a driverless vehicle to pick you up wherever you are, to pay for the ride, to play your favorite Spotify playlist, and even to have your daily Starbucks order ready upon arrival—all with the touch of a screen or voice command.

Of course, this is only one of many visions for the future of connected transportation. Different companies and stakeholders in the industry hold widely varying ideas of what autonomous and electric vehicles will mean for the transportation sector in the coming years—but all agree that the changes are happening fast, and it's going to take hard work and collaboration on safe deployment and effective policy to get it right.

**Christine Coogle,**  
Project Lead,  
Connected  
Transportation  
Strategic Initiative,  
NEMA

*Ms. Coogle is  
the former editor  
and social media  
manager at NEMA.*

*Continued on page 6*

## NEMA's Strategic Initiative

NEMA is exploring its potential role in the transportation transformation through its 2017 Connected Transportation Strategic Initiative, under the umbrella of a broader initiative on smart cities. The goal of this initiative is to increase demand for and ensure the interoperability of NEMA member products in the connected transportation sector.

The initiative involves two workshops (the first of which took place in March, the second is planned for mid-September) to examine the landscape of connected transportation technology and standards today, with the goal of identifying potential vehicle-to-infrastructure (V2I) standards activities that would benefit NEMA member companies. To facilitate this, NEMA is forming a task force with the relevant sections to develop a white paper identifying gaps in standards development where NEMA may have an opportunity for involvement.

If you would like to find out more or get involved with the strategic initiative, contact Patrick Hughes at [patrick.hughes@nema.org](mailto:patrick.hughes@nema.org).



*Continued from page 5*

## Utopian Vision

It seems, anecdotally at least, that the vast majority of those involved with connected transportation imagine these new technologies creating an urban and suburban utopia that is full of self-driving electric vehicles offering personalized, first-class experiences at low cost and free of traffic congestion, auto emissions, and stressful, time-sucking commutes. That future is possible, but it will require collaboration within the industry and among private and public entities to ensure the safety and expediency of the transition.

In this future, self-driving cars will be a service more than a product, potentially multiplying the two-trillion-dollar auto industry into a ten-trillion-dollar industry. Today, a significant number of vehicles are under-used, with some estimates as high as 97 percent; autonomy creates the opportunity for more continuous use. Companies such as Uber and Waymo (formerly a Google project), as well as some auto manufacturers, will own fleets offering rides—as opposed to manufacturers selling cars for individual ownership—in a model known as transportation as a service (TaaS).

Individuals who own self-driving cars will likely dispatch them to generate additional income during times when they would otherwise sit unused in a driveway or parking lot. Parking will be easier with connected vehicles and infrastructure, which will be able to communicate available parking spaces in both streets and garages.

## Greater Safety, Lower Emissions

Many of those looking forward to an autonomous future are rightly enthusiastic about the potential for saving lives. Today, more than 1.25 million people worldwide die in road accidents every year, more than 37,000 of them in the United States.<sup>1</sup> Sensors on connected vehicles perceive what's ahead and can react in an emergency more effectively and quickly than human drivers, potentially leading to significant decreases in road fatalities.

Connected transportation will also lead to a more environmentally friendly future. Less individual ownership means fewer vehicles on the road, which means lower emissions. Once you factor in the increasing deployment of electric vehicles and expanding use of renewables in the power grid, we could be well on our way to a zero-emission transportation system by 2030.

Health and safety improvements will be further realized through improved emergency responses. Accident notifications will be automatic and instantaneous, and emergency vehicles will be able to reach their destinations rapidly. Traffic flows will be easily adjusted, and individual vehicles will move out of the way in a coordinated fashion when receiving signals that an emergency vehicle needs to pass.

*Continued on page 8*

## EVSE Meets Needs with Flexibility



Truly, smart cities look to the future when planning for today. They accommodate innovations that coincide with the lifestyles of their residents.

Electric vehicle supply equipment (EVSE) is one such innovation that will need to be adaptable and future-proofed. To meet the diverse needs of a city, EVSE must provide flexible installation, communication, and networking options.

In anticipating the needs and resources of electric utilities, municipalities rely on open-standards protocols to ensure that the grid is not overwhelmed as a result of this new charging infrastructure. ☺

**Daniel Urban, VersiCharge Product Specialist, Siemens**

<sup>1</sup> "Annual Global Road Crash Statistics." Association for Safe International Road Travel. <http://asirt.org/initiatives/informing-road-users/road-safety-facts/road-crash-statistics>.



## Georgia City Gives Green Light to Connected Transportation



**Bryan Mulligan,**  
President, Applied  
Information, Inc.

Mr. Mulligan  
chairs the NEMA  
Transportation  
Management  
Systems &  
Associated  
Control Devices  
Section.

**A**mong the benefits that connected transportation can deliver in smart cities in the next few years are the potential to

- reduce injuries and deaths on the roadway for motorists, cyclists, and pedestrians;
- improve quality of life by reducing traffic and decreasing stress; and
- improve business efficiency for freight and other business users of the roadway.

This evolution will be accomplished with communication technologies such as customized radio systems and 5G cellular communications.

Currently, cell coverage on most roadways facilitates the connection of various roadway entities: pedestrians are connected to approaching vehicles; cyclists are connected to vehicles; vehicles are connected to intersections; emergency vehicles gain right of way safely; wrong-way drivers are alerted; and freight vehicles get green lights.

Marietta, Georgia, is one community that is driving connected transportation as part of its smart city initiative.

The city is outfitting all traffic intersections with technology that enables bi-directional communication with emergency response vehicles. When emergency medical services must reach someone in need of urgent care, the system gives the green light—literally—to emergency responders. It brings all other traffic safely to a halt before the emergency vehicle enters an intersection.

The technology will be rolled out to synchronize with smart phones, which can then alert motorists, cyclists, and pedestrians when, for example, an emergency vehicle approaches. ☺



## UPS Delivers with Hydrogen-Powered Electric Motor

Delivery giant UPS recently introduced the world's first hydrogen-electric Class 6 delivery truck as part of a \$10 million federal Department of Energy (DOE) program. The hydrogen-powered electric drivetrain delivery van uses a switched reluctance electric motor, which is less costly to manufacture than a permanent-magnet motor, uses fewer parts, and does not need a transmission.

Power output can be regulated electronically to accommodate all types of loads. In addition, removing and repairing an electric motor is quicker, easier, and cheaper than removing and repairing a diesel engine.

The overall electrical system is developed and installed by Unique Electrical Solutions LLC. The project is funded by UPS, DOE, and several California air quality agencies. ☺

**Mike Tankard,** Business Development Director,  
Vehicle Systems, Nidec SR Drives Ltd

Continued from page 6

## Challenges and Opportunities

Connected transportation creates the opportunity for urban planning that prioritizes pedestrians and cyclists more than it has in the past. AVs will be able to drive much closer together than human-operated cars, meaning lanes will be much narrower, leaving more space for bike lanes, wider sidewalks, and green areas.

These changes are coming sooner than you may think. A recent RethinkX report provided an ambitious estimate that as much as 95 percent of U.S. passenger miles traveled by 2030 will be through TaaS, largely due to the drastically lower cost of new transportation alternatives than individual car ownership.

In addition to growing the industry, this shift will result in average annual savings of more than \$5,600 for American families. In other words, this will mean an additional trillion dollars every year in the pockets of American consumers.<sup>2</sup>

Along with vast promise, the future of connected transportation brings the potential for new challenges and problems. In the public sector, the most significant barriers include regulatory uncertainty at the federal level and the use of taxpayer dollars at the state and local levels to set the appropriate standards and develop transportation infrastructure as necessary.

For both the public and private sectors, cybersecurity is already a predominant concern that will only increase—not just for transportation but for the entire Internet of Things ecosystem. Those who develop these technologies must prioritize security from the start and be prepared to fix bugs and deploy updates in real time to help counter cyber threats.

<sup>2</sup> James Arbib and Tony Seba. *Rethinking Transportation 2020–2030: The Disruption of Transportation and the Collapse of the Internal-Combustion Vehicle and Oil Industries*. RethinkX, 2017. Accessed May 2017. [https://static1.squarespace.com/static/585c3439be65942f022bbf9b/t/591a2e4be6f2e1c13df930c5/1494888038959/RethinkX+Report\\_051517.pdf](https://static1.squarespace.com/static/585c3439be65942f022bbf9b/t/591a2e4be6f2e1c13df930c5/1494888038959/RethinkX+Report_051517.pdf).



## Blank-out Signs Improve Safety

Phoenix, Arizona, deployed a double warning system in the drop-off zone of a local school that is prone to high-volume vehicular congestion, especially in the morning.

A left-turn pocket at the school ground's entrance clashes with a right turn lane from the other direction. These opposing lanes are often at odds, with drivers from both directions feverishly attempting to enter the drop zone first. The viable solution was to remove the free right turn, allowing all left-turn traffic to enter during a designated signal phase.

To implement this traffic control strategy, the city looked to light-emitting diodes (LEDs) equipped with sensor technology.

It deployed two 24-inch LED blank-out signs (i.e., signs that blank out or disappear) to signal "no right turn." The first sign is timed to activate in tandem with the signal change to green for opposing traffic.

A second LED blank-out sign reinforced the new traffic control system and protected the only pedestrian crossing into the school grounds. In their attempt to be the first to enter the grounds, frantic drivers had endangered pedestrians.

Both signs were equipped with light sensors to seamlessly adjust to morning light conditions. The absence of a polycarbonate face provides better-than-average contrast for the intense desert sun. The signs are also maximized with complete 30-degree viewing angles, empowered by the calculations of a microprocessor that offers the appropriate lighting for the often-blinding sunset conditions in the Valley of the Sun.

Mike McKay, Account Manager, SES America



Several of the benefits of AVs cannot be fully realized until there are a large number of deployed vehicles; human driver error will be of great concern in the meantime. The industry classifies vehicles in six levels of autonomy: L0 through L5, where L1 is still operated by a driver but may involve park assist and L3 can operate safely without driver engagement on a highway. Only L5 involves continuous, full autonomy, allowing all riders to disengage and sleep, read, or watch a movie while in transit. The lower levels require a driver to engage in some way, if only to take control in particular circumstances.

There is some risk in allowing a driver to relinquish the task of operating the vehicle while still requiring her to pay attention. This will complicate the obstacle posed by a lack of public approval and trust of AVs. Public perception of safety will increase with familiarity, but a few publicized incidents with L2 or L3 AVs, for example, could greatly affect drivers' willingness to surrender control, regardless of the statistics.

Potential challenges are interwoven with opportunities for solving existing problems. Less congestion is often cited as a major benefit of connected, autonomous transportation, but it's also possible that, because of an otherwise improved commuter experience, congestion could get much worse. More people may relocate from urban centers where they work to suburban neighborhoods because commuting would no longer result in wasted time. This would lead to a greater number of vehicles on the road for longer periods of time, creating more traffic and pollution. Avoiding negative effects of traffic and congestion will largely depend on the prioritization of rideshares, as well as accelerated deployment of electric vehicles.

There is also great concern for the future of jobs such as truck driving, which currently employs 3.5 million people in the United States. In the near term, new technologies will be more helpful than harmful in that area; there is currently a shortage of truck drivers, so autonomous fleets will be used to fill those gaps. It will only be a matter of time, however, before AVs replace non-autonomous fleets. In some instances, companies should be prepared to retrain their workforce for new job opportunities that may arise as a result, in place of traditional truck-driving jobs.

## Scratching the Surface

Driving an intelligent transportation ecosystem that allows for safe, first-class, low-cost, zero-emissions experiences, new career opportunities, and positive urban development across the country

is where collaboration and smart policy come into play. Private companies must work together and with federal, state, and local governments to make sure the deployment of new technologies is safe and effective and that it happens in tandem with necessary infrastructure development.

## Testing Autonomy

The Virginia Tech Transportation Institute (VTTI) in partnership with the Virginia Department of Transportation (VDOT) in 2014 created the Virginia Connected Corridors (VCC) initiative to test traditional intelligent transportation systems in real-world deployment environments. Sites include a "smart road" in Blacksburg and a test bed in Fairfax County, one of the most congested highway corridors in the country.

The smart road, which has been in operation since 2000, has produced more than 22,000 hours of research, tackling challenges such as continuous dedicated short-range communications (DSRC) coverage and the effects of variable lighting and inclement weather. VCC tests wireless communications, including DSRC and cellular, for bi-directional information sharing between vehicles (V2V), between a vehicle and the roadway or infrastructure (V2I), and between a vehicle and other moving entities, such as pedestrians, cyclists, and trains (V2X).

While these tests look toward long-term solutions, VDOT is prioritizing particular applications for which this research is useful. These include real-time, in-vehicle dynamic messaging; incident scene alerts for drivers; and probe-enabled traffic monitoring.

One especially promising application is the use of work zone alerts for drivers and workers. This currently exists in a smartphone app, which allows a user to specify an activity and duty status, and that data is sent directly to the VCC cloud. The cloud manages messaging on work zone activity, and warnings are sent to drivers in the area through the mobile app, while workers receive warnings through flashing LED lights or haptic cues.

More information on the initiative can be found at [www.vtti.vt.edu/facilities/vcc.html](http://www.vtti.vt.edu/facilities/vcc.html).

None of the hurdles can be overcome by a single actor. The development and wide deployment of connected, autonomous vehicles to create a safe and sustainable transportation system will require the cooperation of organizations with varying knowledge and authority.

This article only scratches the surface of the challenges and opportunities created by the transformation that the transportation sector is already undergoing. The vision of the future of transportation varies widely, but there is no question that the possibilities are numerous and thrilling. 🚗



Photo courtesy of Philips Lighting

## Connected Public Lighting: A Powerful Accelerator for Smart Cities

Susanne Seitinger,  
PhD, Global Smart  
Cities Segment Lead,  
Philips Lighting

Dr. Seitinger works  
with civic leaders  
and designers to  
develop smart  
cities that leverage  
digital lighting for  
safe, inviting, and  
responsive urban  
environments.

**T**he year 2008 marked a milestone. First, more than half the world's population was living in towns and cities, according to the United Nations Population Fund. Second, for the first time in history, more objects than people were connected to the internet.

The analyst firm Gartner calculates that 8.4 billion connected objects will be in use in 2017, an increase of 31 percent from 2016.<sup>1</sup> As urban migration increases and connected devices proliferate, these parallel trends promise new links between physical spaces and digital infrastructures that increasingly include light-emitting diode (LED) street lighting, site lighting, and architectural lighting.

For municipalities, these two trends present an opportunity and a challenge. Cities small and large are flourishing, but the strain on infrastructure and services is burgeoning. Leaders increasingly reference the potential for real-time information and controls that improve city services and enhance quality of

life. Los Angeles recently implemented an artificial intelligence-based agent that fields many basic requests from citizens. Citizens themselves are also using location-based services and social networking tools in new ways to navigate their cities. Feeding these intelligent systems requires more data from the field, a requisite that is far from trivial.

Enter street lighting. Unlike many other systems, street lighting is omnipresent in our urban environments and provides an ideal backbone for gathering data. At the same time, public lighting does something that no other city service can do: it transforms visual appearances and how people experience places—from streets, parks, and walkways to bridges, monuments, and buildings—producing a particularly strong emotional impact.

More than any other public service, urban lighting is integral to a city's identity, character, and livability. Its two strengths—ubiquity and visual impact—make lighting one of the most powerful accelerators for exploring new, smart city services.

<sup>1</sup> "Gartner Says 8.4 Billion Connected 'Things' Will Be in Use in 2017, Up 31 Percent From 2016," [www.gartner.com/newsroom/id/3598917](http://www.gartner.com/newsroom/id/3598917)



## Shedding Light on Smart Cities

Lighting consumes more than 10 percent of all electricity in the United States, according to the U.S. Energy Information Administration.<sup>2</sup> This presents an enormous opportunity to achieve energy efficiency goals, especially with the transition to LED lighting technology. New LED luminaires consume 50 to 75 percent less energy saving on utility costs, which also benefits the environment. Combine near-real-time monitoring with lighting control and you stand to gain an additional 15 to 20 percent energy efficiency.

While only a few years ago less than two percent of outdoor lighting was connected, we expect 35 percent of outdoor lighting to be connected by 2025. Digital lighting combined with other embedded computing capabilities enables lighting managers to easily monitor status and energy consumption from anywhere, anytime.

New approaches to systems that leverage the cloud and various networking technologies are revolutionizing the old paradigms around lighting control. Capabilities such as integrated workflow management shift how maintenance work gets done in the field. Now, asset data is automatically up to date and field workers can rely on their own first-hand view of the information while they're doing the work. This capability shifts how city operations can be organized.

## Lighting the IoT Pathway

Beyond the impact on street lighting itself, the pervasiveness of the lighting infrastructure is at the heart of discussions on how to deploy new IoT networks in cities. It is already powered, and it is increasingly connected. The next step is to leverage each location as part of a pathway for gathering, sharing, and analyzing data at a much more fine-grained spatial and temporal rate.

In 2016, the city of Los Angeles piloted a project to expand its smart city capabilities by collecting acoustic data through its street lighting system. This provides near-real-time insights about potential noise pollution or incidents, enabling better short-term responsiveness and long term decision-making. Unlike any other system, street lighting has the potential to foster new ideas around distributed sensing in cities.

Collecting additional data from the field needs to be linked with specific policy goals. Every city is driven by a distinct set of forces that might demand prioritization

of one issue over another. Jennifer Belissent of Forrester Research refers to the networks in the field as systems of automation to connect the physical world, another way of referring to IoT.<sup>3</sup> These data are linked with what are called systems of record. It isn't until systems of engagement are linked with constituents and citizens that we can expect smart city solutions to deliver systems of insight.

To facilitate a speedier exploration of potential insights, we need open technologies and well-defined software interfaces. These interfaces enable city managers to link services together and manage them centrally and comprehensively. Well-defined interfaces also afford an opportunity to start small and implement new applications quickly, as technologies evolve and needs grow and change. Many new applications, unforeseeable today, will evolve, ensuring the vibrant city life that people expect well into the future.

## What's Ahead?

Lighting reflects the metabolism of the city: on a large scale, a lighted skyline reveals non-stop activity; on a smaller scale, individual citizens can control their environments. Adaptive digital lighting solutions can contribute significantly to city operations and livability. Lighting alone, however, cannot revitalize a city or neighborhood. Rather, it is a vehicle that reconnects people with places and emphasizes the true strengths of their community.

In 1989, the city of Lyon, France, introduced a holistic lighting masterplan that revitalized the historic core of the city. Today, Lyon is known as the capital of light, hosting the largest festival dedicated solely to illumination, the Fête des Lumières.

As cities address new challenges, how will they leverage the capabilities of digital lighting linked with smarter infrastructures and new services to address the significant challenges of the 21st century? Anthony Townsend captures the challenge well when he talks about not only increasing "efficiency, control, convenience" but also focusing on "sociability, transparency, fun."<sup>4</sup>

It is especially this latter category that may make all the difference in the long run to shape and sustain resilient, vibrant, and equitable cities. ☺

<sup>3</sup> "Case Study: How Buenos Aires Became Insights Driven," <https://www.forrester.com/report/Case+Study+How+Buenos+Aires+Became+Insights+Driven/-/E-RES121454>

<sup>4</sup> Anthony Townsend, *SMART CITIES: Big Data, Civic Hackers, and the Quest for a New Utopia* (W.W. Norton, 2013).

<sup>2</sup> "Frequently Asked Questions," <https://www.eia.gov/tools/faqs/faq.php?id=99&t=3>

# DICOM Keeps Healthcare Secure and Smart

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Communication,  
and Outreach  
Working Group.

**N**ot so long ago, health information consisted of paper folders and huge film archives.

In most cases, these records were not easily accessible and often were located in hospital basements. Patient information was available in each department, but even there, multiple folders could exist.

Even with the advent of digital healthcare imaging, those systems continued; information was not shared across departments. Digital Imaging and Communications in Medicine (DICOM, a NEMA standard also known as PS3) served as the means to gather and access images and related information across acquisition devices, imaging workstations, and image storage systems, but information remained in silos within hospital departments. Thus, there would be a DICOM system for the radiology department but also one for cardiology, and the two were probably not connected, let alone the same.

## Changing Times

Healthcare is becoming smarter.

More hospital DICOM ecosystems have been deployed, and all imaging data can be handled in one. Cross-enterprise information sharing is growing, and all of this sharing serves the patient. As more relevant and actionable data are available, physicians can better support their patients.

Beginning in the early 2000s, a web interface for retrieving imaging studies was defined, and from 2010 onwards, DICOMweb has become the pinnacle of DICOM continuous extensions, which are meeting the demands of the clinical world.

DICOMweb is a term applied to the family of RESTful<sup>1</sup> DICOM services for sending, retrieving, and querying medical images and related information. The intent is to provide a lightweight, mobile mechanism for

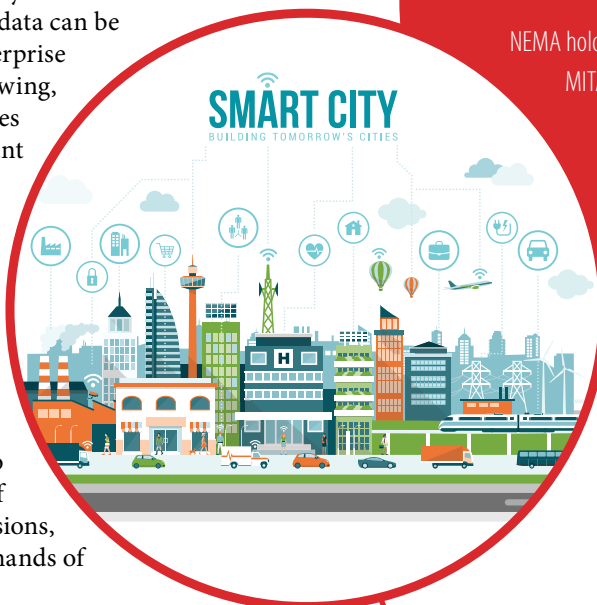
accessing images. It can be implemented by developers who have minimal familiarity with DICOM and use consumer application-friendly mechanisms to the maximum extent possible.

As healthcare professionals and patients increasingly work with mobile devices and web browsers, DICOMweb services meet their needs to access information securely. Smart healthcare organizations share data in the interest of patients. With DICOMweb, medical imaging data can be exchanged rapidly and securely.

As smart cities connect with other smart cities, the exchange of health data is not limited to city borders, either. Smart cities require smart hospitals. DICOM is up to the task. ☺

DICOM is an acronym for Digital Imaging and Communications in Medicine. It is a global information technology standard that ensures the interoperability of systems used to produce, store, display, process, send, retrieve, or query medical images.

NEMA holds the copyright to this standard.  
MITA/NEMA is its secretariat.



<sup>1</sup> Representational state transfer (REST or RESTful) resources provide interoperability between computers.



# Notification Technology Improves Fire Response



Photo courtesy of Applied Informatics

**W**hen a call comes into a 9-1-1 dispatch center, it needs an immediate response.

The way first responders are notified has come a long way from ringing a bell or the box alarm system. With the increased congestion of roadways, the fire service is looking at means to notify responding firefighters faster and reduce response times.

Emergency dispatch centers can now grab an address from a traditional landline or locate it within close proximity of a cell call. Many communities now receive requests via text. Knowing the nature of the emergency is critical for alerting responding fire service personnel.

Once the call is received, a computer-aided dispatch (CAD) system typically advises the dispatcher, who then uses an alarm code to notify the appropriate station. This can be done with a telephone or a radio call, which also may open an audio pager. Many fire service agencies use two methods for notification.

Because of the speed and widespread use of cellphones, many communities simultaneously transmit a radio call while the CAD pushes a text or page to an app program, such as iamresponding. This notifies responders quickly. Staff may also use a program that shows the location of responding firefighters and can even track who is responding.

As soon as vehicles begin to respond, other technologies aid in reducing response time and making the response as safe as possible. Today's modern fire engines use computers and GPS to map a route and share the location with other responders.

One of the most dangerous locations for the apparatus is every intersection. Ensuring the safety of responders and those on the road alongside the responding apparatus is important. Some communities use technology to control an intersection's lights through a flashing strobe or GPS. Preemption systems allow the intersection light to turn green in the direction of travel, or change all the lights to red.

While responding, a non-driver company officer uses on-board computers, handheld tablets, or even paper copies of a pre-incident plan that give the responding crew an idea of the building layout, systems, and hazardous materials.

Responding crews rely on technology to assist their responses. For instance, intelligent fire alarm systems allow for a greater understanding of where the alarm was initiated and the current status of the critical systems in a building.

The changes that have occurred over the past 10 years give staff greater information at their fingertips. It is unknown where technology is taking our fire service over the next 10 years, but it is certain the streaming video to a command center or GPS tracking for fighters is sure to top the list. 📶

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## Smarter Housing Embodies Energy Efficiency

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Vice President,  
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Dixie Comeau,  
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**L**ast March, we introduced *electroindustry* readers to our net-zero home in Warwick, New York. We are framed, closed, and thrilled.

Designing an efficient heating, ventilation, and air conditioning system was a major accomplishment.

The area of the house is about 2,000 square feet on the main floor and another 1,000 square feet (partially underground) on the floor below. Although the house is not large by most standards, the HVAC design is challenged by vaulted ceilings that peak at 24 feet. Despite construction and insulation methods that nearly hermetically seal the interior, the space requires a cocktail of three different heating and cooling technologies to maintain comfort through the hot summers and cold winters of New York State.

After analyzing the space and consulting with our contractor and HVAC experts, we created a unique system to condition our home efficiently.

The vaulted great room, consisting of kitchen, dining room, living room, and music room, will be served by a combination of radiant heat in the floor and a pair of electric mini-splits located on the walls, about 12 feet high, at the rear-facing wall. The bedrooms, bathrooms, den, and utility areas will be heated and cooled by a gas-fired hydronic forced air system, delivered by an insulated ductwork layout.

Electrical components will be tied to the solar energy supply, while a buried propane tank will deliver fuel to the cooktop burners and gas fireplace. An instantaneous (tankless) water heater will feed showers and baths.

To properly control humidity and temperature, three heating/cooling platforms will connect to a single automated control system that will respond to wireless sensors located in key areas throughout the house. With some software tweaking, we expect the systems to keep the indoor humidity within a prescribed range while maintaining comfortable temperature levels.

Since the house is essentially airtight, a low-volume air-handling and air-circulating system will keep fresh air flowing at all times. All air-handling ductwork and water carrying pipes were routed through conditioned space inside the house (as opposed to exterior walls), so the amount of heat loss across the ducting and piping systems is negligible.

Although we are getting maximum efficiency with a low carbon footprint in a state-of-the-art home, it is rather expensive. We're happy to be first adopters for much of the technology, and believe that as these methods of construction, insulation, and climate regulation become more commonplace, the returns on investment will improve dramatically.

Follow us at [warwickbarn.blogspot.com](http://warwickbarn.blogspot.com). ☺



## Electric Vehicle Supply Equipment—Not So New

The 1996 edition of the *National Electrical Code*® (NEC) included for the first time an article dedicated to electric vehicle (EV) charging requirements, leading some to believe that the industry began in the 1990s. Actually, it originated in the mid-1800s as one of the first markets for electric motor, storage battery, and distribution equipment manufacturers.

Between 1834 and 1896, small-scale production of EVs encouraged interest. EVs could outperform steam- and gas-powered automobiles. The first car dealership in the United States sold only EVs, and the first auto race in the nation was won by an EV. By 1900, large-scale production ushered in a golden age; by 1917, more than 40,000 EVs were on the road; and by 1920, there were several EVSE manufacturers, 700 charging stations, and unfortunately, 38 separate charging plug configurations.

Early manufacturers adopted the “slow-speed” motor. The 80V motors operated at 800 to 900 rpm and could push a 700-pound to five-ton vehicle up to 30 mph. The most common storage battery was standard lead-acid, the largest manufacturer of which was the Electric Storage Battery Company. The other was the Edison alkaline storage battery, which cost twice as much but had superior performance. It had a life of about 9,000 miles through rectified charging methods, requiring eight-to-12 hours of charging time.

EV supply equipment (EVSE) in the early 1900s included direct current (DC) charging from a 110–220 VDC source or alternating current (AC) from a 500–600V source. The most common AC rectifiers were motor generators, rotary converters, and mercury arc rectifiers.

Before the 1996 NEC, requirements for EVSE were scattered throughout the code. Section 5109 of the

1937 edition included requirements for battery charging. The 1947 NEC revised the title to Electric Vehicle Charging and moved the rules to Section 5133. In subsequent editions, EV charging was in Section 5105.h, Section 511-8, and finally Section 511-9 of the 1993 NEC. Article 625 of the 2017 NEC has four parts, 23 articles, and 20 definitions.



Rapid development of the gasoline-powered vehicle, the lack of electrical infrastructure outside of cities, and the great depression brought an end to the first golden age. Many enthusiasts claim we are in the second golden age. An estimated 625,000 EVs are on the road today, using more than 70,000 charging stations. The availability, speed, and convenience of EV charging must be comparable to fueling gas-powered vehicles for the industry to fully disrupt and overtake the transportation industry.

In the article “Seeing Ahead for the Electric Vehicle,” in the February 1917 issue of *Electric Vehicles Magazine*, Thomas Edison said:

The growth of the electric vehicle has been hindered by lack of charging facilities. It's a funny business when so few central stations realize that there is a market for the sale of current for charging electric cars. The public is in a curious position of wanting to buy something for which there is no place to go.... Sometimes I think the men who ought to see ten years ahead see only to next week.

These sentiments hold true today. ☹

Detroit Electric automobile, produced for Anderson Electric Car Company, toured the Northwest in 1919. Mt. Rainier is in the distance. Photo by Cress-Dale Photo Company photographer, courtesy of the Library of Congress

NEMA represents manufacturers of EVSE products and assemblies in their efforts to develop the market by educating the public on features and value.

Learn more at [www.nema.org/EVSE](http://www.nema.org/EVSE).

## States Embrace Energy Efficiency Policies

A large part of the energy efficiency industry's growth hinges on decisions made by state lawmakers and regulators. Overall, states are embracing energy efficiency policies; more than half have adopted energy efficiency resource standards. These standards spur industry growth by requiring electric utilities to meet mandatory energy savings targets and leveraging customer investment in new technologies, services, and products.

Some states, however, including Indiana and Ohio, have recently rolled back previous energy efficiency policy gains.

Over the last several months, NEMA has closely collaborated with a group of manufacturers to support and defend state-level energy efficiency policies that benefit the industry. This work has seen tremendous success.

In Colorado, for example, NEMA joined testimony in support of HB 17-1227, a bill to extend the state's Energy Efficiency Resource Standard for 10 more years. The bill had bipartisan support and was signed into law by Governor Hickenlooper in May.

In Nevada, NEMA joined testimony on two bills, AB 223 and SB 150, which should expand the scope of energy efficiency technologies supported by utility programs in the state. Both bills had very strong bipartisan support. AB 223 was signed into law in May; SB 150 was recently delivered to the governor.

In Ohio, NEMA joined testimony and supported efforts to reinstate the state's Energy Efficiency Resource Standard. The standard went back into effect in January when Governor Kasich vetoed HB 554 late last year. ☺

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## Midwest States Overcome Adoption Challenges

Many states have initiated adoption of the next edition of the *National Electrical Code* (NEC). To date, 24 are in the process of adopting the 2017 NEC. Twelve are located in the Midwest.

Earlier this year, Kentucky's electrical board voted to adopt the 2017 NEC as amended. Shortly after the committee's action, however, the governor removed all the trade boards and appointed one committee to oversee all building codes in the state. During this time, the Homebuilders Association of Kentucky began to pressure the Department of Housing, Building, and Construction to amend inclusion of arc-fault circuit interrupters (AFCIs) in the 2017 NEC adoption. Kentucky's electrical industry coalesced to keep this fire and electrical technology in the adoption. As a result, the state's committee voted to keep arc-fault technology as written in the 2017 NEC adoption.

The Michigan Department of Construction Code Electrical Division is reviewing the 2017 NEC for commercial buildings in the state, with no effective date yet announced.

In April, the Ohio Board of Building Standards (OBBS) held a public hearing on adoption of the 2017 NEC for commercial buildings. As a result of testimony, the OBBS voted to move forward with adoption with an effective date of September 1 for the commercial code. The Residential Code Advisory Committee will convene in the fall to review 2017 NEC adoption for one-, two- and three-family dwellings.

In May, the South Dakota State Electrical Commission held a public hearing to hear testimony on the adoption of the 2017 NEC. During that hearing, the National Association of Homebuilders and its local representatives spoke against including AFCIs in the code, citing fire statistics that don't support keeping them in the code. NEMA, the National Fire Protection Association, and local electrical industry partners spoke in support of keeping AFCIs in the code. After a vigorous discussion between opponents, proponents, and committee members, the commission saw the value of these safety devices in residential structures in the state and voted to keep AFCIs in the code adoption without amendments. 🗳️



Jean Johnson

Technical Program Manager, NEMA

## Updating Airport Security with DICOS

In 2012, NEMA's Industrial Imaging and Communication (IIC) group published NEMA IIC-1 v02 *Digital Imaging and Communications in Security (DICOS) Information Object Definitions*, known colloquially as DICOS v02.

DICOS v02 is a data interchange protocol with an interoperable, extensible file format that enables the exchange of security screening data. In the United States, this includes x-ray for carry-on baggage, computed tomography (CT) for checked baggage, and advanced imaging technology for passenger examination. DICOS v02 also includes some provisions for material-specific information, trace detection signatures, and standardized threat detection reports.

Since the publication of DICOS v02, various implementation projects have identified clarifications, additions, and corrections. Lessons learned have been captured in a draft referred to as DICOS v02A. Currently in the NEMA balloting process, the revision should be published later this year.

Concurrently, NEMA IIC is evaluating the need for additional functionality in a prospective DICOS v03. Preliminary guidance from the group indicates that the new document's functionality may reflect the implementation of additional screening methodologies that have matured since the publication of DICOS v02.

For further information, contact Jean Johnson at [jean.johnson@nema.org](mailto:jean.johnson@nema.org). 📧

## Portable Traffic Systems Aid Safety in Work Zones



Photo courtesy of  
Horizon Signal Technologies, Inc.

The newly published NEMA TS 5-2017 *Portable Traffic Signal Systems (PTSS) Standard* covers traffic signaling equipment used to enable and expedite the safe movement of vehicle traffic in roadway work zones, such as single-lane road closures during emergencies and planned events.

According to Scott Heydt, director of marketing at Horizon Signal Technologies, Inc., and chair of NEMA's 03TS Portable Traffic Signal Technical Committee, "NEMA TS 5 provides the traffic control industry with a much-needed standard for portable traffic signals, which differ significantly from permanent traffic signal installations. Now NEMA TS 5 accurately reflects the latest technologies being used in the industry."

NEMA TS 5-2017 is available for \$142 in hard copy or as an electronic download on the NEMA website.

### OTHER RECENTLY PUBLISHED STANDARDS

ANSI C18.1M, Part 2-2017 *American National Standard for Portable Primary Cells and Batteries with Aqueous Electrolyte—Safety Standard*, available for \$99 in hard copy or as an electronic download on the NEMA website.

ANSI C78.45-2016 *American National Standard for Electric Lamps—Self-Ballasted Mercury Lamps*, available for \$141 in hard copy or as an electronic download on the NEMA website.

ANSI C78.52-2017 *American National Standard for Electric Lamps—LED (Light Emitting Diode) Direct Replacement Lamps—Method of Designation*, available for \$350 in hard copy or as an electronic download on the NEMA website.

NEMA TC 19-2017 *Nonmetallic Riser U-Type Guards*, available for \$93 in hard copy or as an electronic download on the NEMA website.

NEMA VE 1-2017 *Metal Cable Tray Systems*, available for \$84 in hard copy or as an electronic download on the NEMA website. ©



## I Am the Electroindustry

Our world is becoming more electric and that electricity needs to be safe, reliable, efficient, sustainable and connected. A comprehensive, thoughtful energy policy will move us forward as a nation in establishing a secure energy future that also creates jobs and drives U.S. competitiveness.

My role with Schneider Electric supports policy that advances the energy revolution and encourages new innovations like the connected technologies that reshape industries, transform cities, and enrich lives.

As a member of the High Performance Building Council, I have the pleasure of helping cities set building efficiency goals as well as educating states on the importance of electrical safety codes. NEMA drives technical, consensus-based standards that prevent serious injuries and death, and are in the best interests of the industry and users.

NEMA brings together talented energy professionals and I am delighted to be one of them. ☺



Stephanie Byrd, Senior Manager,  
Government Relations, Schneider Electric

Joel Solis

Conformity Assessment Manager,  
NEMA

## NRTL Program Update

Recently confirmed Secretary of Labor Alexander Acosta oversees more than 28 regulatory agencies and boards under the jurisdiction of the Department of Labor. One of them, the Occupational Safety and Health Administration (OSHA), is responsible for enforcing the standards, rules, and regulations with which employers comply to demonstrate that a workplace is free from recognized hazards.

The electrical industry is keenly interested in OSHA's National Recognized Testing Laboratories (NRTL) program, which accredits electrical product testing laboratories as NRTLs. The program relieves employers of the burden of demonstrating that an electrical product used in the workplace is safe by showing that it is NRTL "approved" or "labeled."

The NRTL program currently recognizes 18 certification and testing laboratories: 13 in the United States, four in Canada, and one in Germany. The German Product Safety Act, incidentally, bars reciprocal privileges to U.S. and Canadian NRTLs to issue its mark that indicates that electrical products meet German safety requirements.

The NRTL program continues to expand the number of certification and testing laboratories. Bay Area Compliance Laboratories (BACL) in California is the latest certification and testing laboratory to receive recognition. BACL's scope of recognition is limited to UL 60950-1 *Information Technology Equipment*.

Since August 2014, OSHA has been updating its policy on how NRTLs comply with the requirements in the OSHA NRTL Directive, which addresses manufacturers' testing of electrical equipment intended for hazardous locations and to align the program's policies to ISO/IEC 17065 and 17025, and the IECEx electrical equipment scheme.



NEMA contributed comments to the latest draft of the directive, which was circulated to stakeholders in June 2016. The process for finalizing the directive will require a determination of whether the revision would result in a shift of OSHA policy, followed by approval by Secretary Acosta.

Publication of the final version is anticipated by the end of the year. It should not be affected by the recent Executive Order on Reducing Regulation and Controlling Regulatory Costs, which requires that at least two existing regulations be repealed for every new one that is promulgated. ☺

## Exploring Trade in Cuba



The NEMA trade delegation visited Mariel Port and Special Economic Development Zone to learn about Cuba's plans to attract foreign investment.



Ambassador Jeffrey DeLaurentis (standing) briefed the delegation at his residence. Photos by Jonathan Stewart

In early May, a NEMA delegation of 13 member companies visited Havana for discussions with Cuban policymakers. Beginning in 2015, a series of executive orders issued under the Obama administration not only made the trade mission possible but also allowed companies in the United States to sell electrical products to Cuba if granted an export license.

Since trade sanctions effectively have prevented any U.S. commercial activity with the Caribbean island for 60 years, NEMA members wanted to understand how a trade relationship might work. The mission provided them with information to facilitate assessment about pursue export opportunities.

Cuba's electrical sector represents great potential for U.S. exporters. Its electric grid is based on the North American system, and the country relies on an older version of the *National Electrical Code®* for installation of electrical products. Over the course of three days, the delegation met with personnel whose agencies impact the domestic electrical sector, including the Ministry of Energy and Mines, Ministry of Construction, Ministry of Industry, Ministry of Foreign Investment, and the Office of National Standards.

Members also toured a distribution substation, as well as the Mariel Port and Special Economic Development Zone. Ambassador Jeffrey DeLaurentis, chargé d'affaires at the U.S. embassy, welcomed the delegation to his home for a political briefing.

Cuba boasts of a highly educated and trainable workforce—perhaps its greatest asset. Government officials at the highest level publicly recognize the need for economic reforms in areas where the socialist system has not worked. Most important, Cuba is hungry for U.S. products and tourists. Were the embargo to be lifted, the latter would go a long way in paying for the former.

Market irregularities, such as lengthy payment terms and closely controlled government contracts, would not disappear with the normalization of trade relations, which is by no means a foregone conclusion. While it is unknown what the United States–Cuba relationship might be in five or ten years, businesses need that time to learn more about the market and develop the relationships needed to engage there. ☎



## Confidence Indexes Remain in Expansionary Range

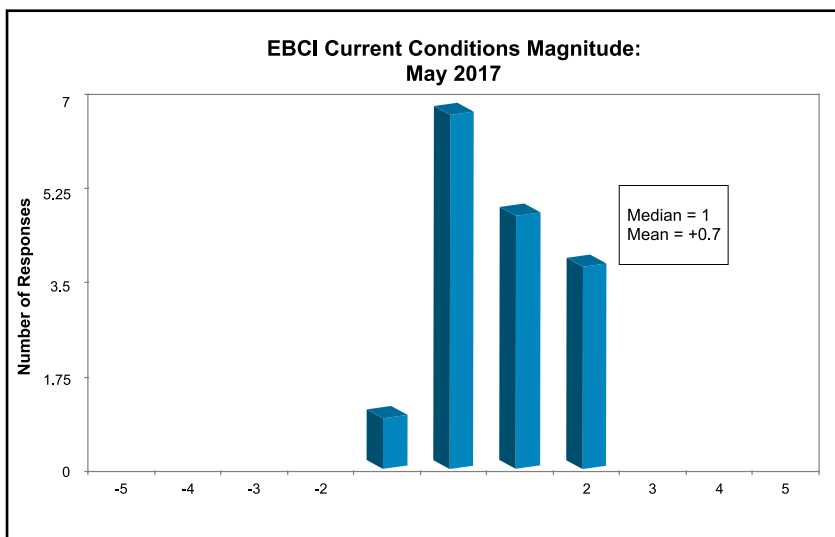
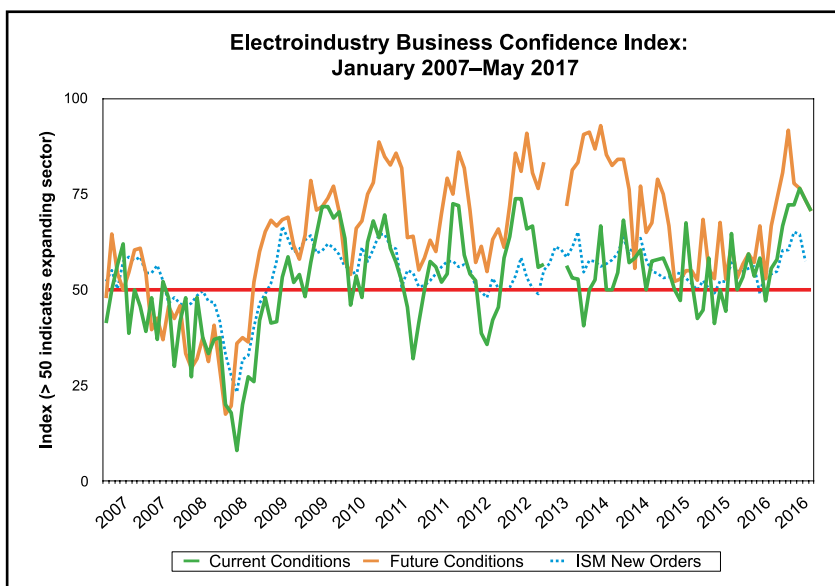
The current and future confidence indexes moved in lockstep for the third consecutive month, each pulling back nominally from 73.5 in April to 70.6 in May. At this level, the indexes remain well in expansionary range, even as the current-conditions responses suggest movement toward a sense of status quo with the six-point decline in those registering better conditions—from 53 percent in April to 47 percent in May—taken up entirely by the six-point increase, to 47 percent, in those seeing unchanged conditions. Those witnessing worse conditions held steady at six percent. Comments were largely positive, with a dash of uncertainty about specific end-use sectors, including the industrial and utility markets.

The range of responses to the survey's measure of the intensity of change in electroindustry business conditions narrowed somewhat, and the mean score ticked down slightly from +0.8 in April to +0.7 in May. Panelists are asked to report intensity of change on a scale ranging from -5 (deteriorated significantly) through 0 (unchanged) to +5 (improved significantly).

A majority of respondents expect improved conditions in six months, although the 53 percent share of those who do marks a sharp pullback from the 65 percent reporting similarly in April. Unlike the current-conditions reporting, the share of those expecting worse conditions declined from 18 percent in April to 12 percent in May. The largest swing came from those expecting conditions to remain unchanged. That share jumped from 18 percent in April to 35 percent in May. Comments regarding expectations for the business environment tend to be upbeat, but political uncertainty remains a concern.

Visit [www.nema.org/ebci](http://www.nema.org/ebci) for the complete May 2017 report. 📄

	Current Conditions (Compared to Previous Month)	Conditions Six Months from Now (Compared to Current Conditions)
EBCI	70.6 ▼	70.6 ▼
% Better	47% ▼	53% ▼
% Worse	6% ▬	12% ▼
% Unchanged	47% ▲	35% ▲



### STOCKART

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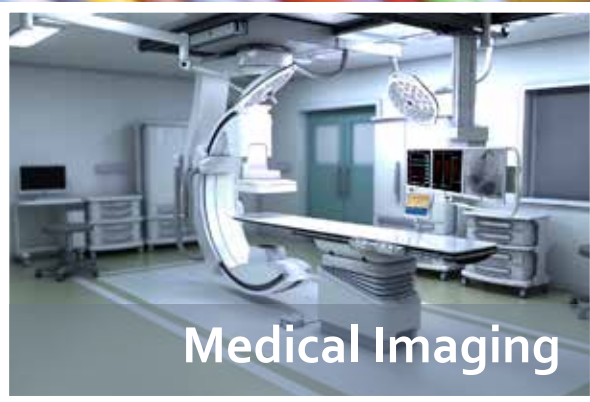
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