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# Energy Savings Performance Contracts: A Blueprint for Rebuilding Municipal Infrastructure

2017 Hermes Award Winner 2017 Azbee Award 2016 MarCom Award Winner

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### electroindustry

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Energy Savings Possible for URBAN WATER UTILITIES www.waterenergytoolkit.org

Significant energy and water savings in the water utility sector are possible and financially viable, according to a recent study commissioned by the National Electrical Manufacturers Association (NEMA). *Increasing Energy Efficiency in Urban Water Systems: Summary Report* provides results and analysis conducted by NEMA and GEI Consultants Inc. NEMA worked with member experts as well as volunteers from the Hydraulic Institute and the International Association of Plumbing and Mechanical Officials, and sourced hundreds of existing reports and studies to analyze energy consumption, water throughput and consumption, and related energy-water metrics.



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- Staff training
- Federal grants

#### FROM THE **PRESIDENT**



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"We are going to fix our inner cities and rebuild our highways, bridges, tunnels, airports, schools, hospitals," said President Donald Trump on the night of his election. "We're going to rebuild our infrastructure, which will become, by the way, second to none. And we will put millions of our people to work as we rebuild it."

This reiterated campaign promise—to make a major investment in American infrastructure—specifically highlights the opportunity presented by the municipal, university, school, and hospital buildings markets. On February 12, 2018, the White House followed up on that promise by releasing a framework for \$200 billion in federal spending that would leverage an additional \$1.3 trillion in state, local, and private funding.

Since the beginning of our country, American presidents have seen infrastructure investment as a fundamental building block of economic development, to which the private sector has lent ingenuity and entrepreneurialism. President George Washington founded the Patowmack Company in 1785 to build privately funded canals to ferry goods between the East Coast and the Ohio Territory; President Franklin Roosevelt oversaw the Public Works Administration, which constructed buildings, schools, hospitals, airports, roads, bridges, and dams; and President Dwight Eisenhower championed the Interstate Highway System to facilitate safe and efficient transcontinental travel.

Today, the private sector still supplements government investments in infrastructure. Energy service companies use innovative financing methods like energy savings performance contracts (ESPCs) to upgrade federal and buildings of all kinds without the need for taxpayer funds. Instead, upgrades are funded through the energy savings over time.

ESPCs have been used at the federal level for more than two decades, and over that time they have leveraged more than \$5 billion in privately funded upgrades to federal facilities, saving more than \$12 billion in cumulative energy costs. In FY2016 alone, ESPC projects totaled more than \$700 million, and in FY2017, NEMA Member Honeywell was awarded the single-largest federal ESPC: a \$262 million project to reduce wasted energy by 35 percent in 50 buildings at Tinker Air Force Base Air Logistics Complex in Oklahoma City. This project will achieve its energysaving target by installing light-emitting diodes, advanced lighting controls, smart meters, and a building energy management system, among other upgrades.

Passage of President Trump's \$1.5 trillion infrastructure proposal is unlikely in 2018 because of the rancorous political atmosphere in Washington and the fast-approaching midterm elections. However, the hope remains that innovative public–private investments—like ESPCs—will continue to reinvigorate America's buildings, electrical grid, water delivery systems, connected transportation systems, and other infrastructure.

In 1934, President Roosevelt noted in a fireside chat that infrastructure projects are "designed to put more men back to work, both directly on the public works themselves, and indirectly in the industries supplying the materials for these public works." As the association representing the "industries supplying the materials for these public works," NEMA will continue to advocate for policies that promote both public and private infrastructure investments in 2018, 2019, and beyond.

Kevin J. Cosgriff President & CEO

#### **Saving Energy and Taxpayer Dollars with ESPCs**

When most people think about energy, they may first think about using it to power personal devices. After that, they may think about what is required to light, heat, and operate the buildings in which we live and work.



Senator Coons is the senior Democrat on the Senate Judiciary Subcommittee on Oversight, Agency Action, Federal Rights, and Federal Courts.



Senator Gardner is a member of the Senate Energy & Natural Resources Committee and chairs the Energy Subcommittee.

Buildings represent about 40 percent of the primary energy consumption in the United States, and who owns the most buildings and uses the most energy in the U.S.? The federal government. So, as our country continues to make strides to become more energy efficient and secure, there's no better place to start than the energysapping constellation of federal real estate.

As a Democrat and a Republican, we believe that the federal government should be a model of energy efficiency, not the exception to it. To make federal buildings more energy efficient, we've introduced legislation to support energy savings performance contracts (ESPCs), public-private partnerships that allow the federal government to work with the private sector to reduce energy costs, cut back on greenhouse gas emissions, and save taxpayer dollars.

This concept started in 1978 when Congress passed the National Energy Conservation Policy Act, giving federal agencies the authority to enter into shared-energy savings contracts with private-sector service companies. These early ESPCs established a means for the federal government to undertake retrofits through energy-efficiency services, reducing energy intensity and saving money over time at no added cost to the taxpayer. In 1992, ESPCs were authorized as a pilot program. Since then, more than 300 ESPCs have led to billions of dollars in federal cost savings. They have achieved nearly \$14 billion in energy savings. Federal agencies have reduced their energy intensity by 49 percent since 1975, and the program has resulted in at least 114,000 private sector jobs.

This technical and important approach to energy efficiency has shown itself to be a commonsense way to support local jobs, help the federal government save energy, and allow us to invest in clean energy, energy efficiency, and water conservation projects that are critical to our economic future. We believe this mechanism should be a key pillar of our efforts to create a cleaner energy future, with the federal government leading by example.

As a Democrat and a Republican, we believe that the federal government should be a model of energy efficiency, not the exception to it.

To ensure that ESPCs continue, we spent several years clarifying the budget scoring rules so that ESPCs are not constrained. With that behind us, we have introduced legislation to enhance ESPC activities throughout the federal agencies.

Our legislation can help, but we also need the White House and federal agencies to do their part. President Bush's efforts improved tracking mechanisms, and President Obama set a goal of achieving more than \$4 billion in private sector investment through ESPCs over five years. We believe that the Trump Administration is perfectly positioned to go big with ESPCs by maximizing the cost savings that can be accrued through setting new goals and encouraging new partnerships.

Now is the time for good policy to provide continued incentives to save energy, save money, and create American jobs.

#### **Survey Reveals Limited Knowledge of SPDs**

ast year, the Electrical Safety Foundation International (ESFI) conducted a survey of electrical designers, planners, and engineers who design or renovate systems in industrial facilities, healthcare facilities, and IT centers. The survey results demonstrated a limited or misinformed understanding of surge protection devices (SPDs).

An important factor revealed by this survey was that industry engineers and experts were unable to distinguish SPDs from overcurrent devices or circuit interrupters, such as a GFCI breaker. SPDs are designed to handle fast transients or surges, rather than excess voltage or current. While some Type 1 SPDs may be equipped with external overcurrent protection, it should be noted that this is not the case with all variations of SPDs and that it is not the primary function of the devices. Likewise, overcurrent devices do not provide surge protection. In response to the survey results, ESFI created educational materials to spread awareness of the purpose and effectiveness of surge protection.

For the full results of ESFI's Surge Damage Survey, or to learn more about surge protection devices, visit www.esfi.org.

#### **SUPPORT ESFI**

Financial donations to ESFI, a Section 501(c)(3) nonprofit organization, promote the development of free resources like the SPD materials. By supporting electrical safety awareness, you help to strengthen a culture of electrical safety in your community, workplace, school, and family.

Contributions to ESFI 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.

Andrea Viñas, Communications Coordinator, ESFI



#### Exploring Building Management Systems

NEMA will host a general interest meeting for a new building management systems (BMS) section at its Rosslyn office on April 4, 2018. BMS includes hardware and software to optimize and manage performance and occupant comfort through the building's energy, water, gas, and safety systems. This could also include software for tracking and reporting energy usage.

The general interest meeting will discuss

- challenges and opportunities in the BMS space;
- ways that NEMA can help meet and manage the challenges and opportunities in the BMS space;
- the scope of the BMS area; and
- how other existing sections are complementary.

For more information, contact Brian Marchionini, 703.841.3279, brian.marchionini@nema.org.



92nd NEMA Annual Membership Meeting La Cantera Resort and Spa San Antonio, Texas November 14-15, 2018



NEMA is hosting a series of webinars as part of a 2018 Strategic Initiative to help the industry stay abreast of topics in the Internet of Things (IoT). Visit **www.IoTNOWwebinars.org** for more information.

Date   1–2 pm EST	Торіс
January 19, 2018	A Manager's Guide to Augmented Reality
February 12, 2018	Demystifying Blockchain
March 20, 2018	How the IoT has Revolutionized Medical Imaging
April 17, 2018	Make the Most of your Big Data Investments
May 14, 2018	Smart Manufacturing: Factories of the Future
June 18, 2018	Artificial Intelligence and Machine Learning
July 16, 2018	Getting an Edge on IoT Architecture
August 13, 2018	Managing Supply Chains in Real Time with Smart Sensors
September 17, 2018	Battery-powered Technology in the IoT
October 12, 2018	Transportation Transformation: What's Driving the Future?
November 19, 2018	5G Communications: Better, Stronger, Faster
December 17, 2018	The Security of Things: Privacy, Protection, & Proprietorship

# **Energy + Water Strengthens Both**

Energy use is embedded in the supply, gathering, and treatment of clean and wastewater in U.S. infrastructure, and water is embedded in the generation and application of energy. Where the two converge is a crossing point that is poorly understood outside facilities management. This nexus represents significant strategic opportunities.

The result of a 2016 NEMA Strategic Initiative to study the relationship of electricity and water in urban water systems, the Water Energy Toolkit<sup>1</sup> provides resources to educate water utility owners, managers, and employees about:

- Improvements and upgrades to water systems
- Paying for energy-saving programs
- Pump, motor, metering, and control systems training

This online toolkit compiles information that can be used to identify potential improvements and to explore the use of an energy service company (ESCO)<sup>2</sup> to justify and encourage private improvements.

#### Out of Sight, Out of Mind

Many people see water infrastructure only when they are stuck in traffic during the trenching operations necessary to lay pipe and culverts. Thus it is easy to lapse into an "out of sight, out of mind" frame of reference. The result is that water facilities fare poorly when it comes to improvements and maintenance. Tight budgets leave facility managers unable to undertake elective maintenance upgrades while privatized utilities can find themselves at the mercy of shortsighted shareholders who do not favor investments in efficiency.

Only in areas where water is increasingly scarce, such as the ongoing California drought, are we beginning to see public campaigns that might begin to incentivize and promote water–energy efficiency efforts.<sup>3</sup> Elsewhere, water management regulations and laws, if any, tend to focus on low-water usage appliances only. Many NEMA Members function as ESCOs in the energy sector, selling energy savings performance contracts (ESPCs) for energy-efficiency upgrades and services. This contrasts with far fewer ESCO businesses for energy embedded in the water supply or for water savings through efficiency improvements.



#### Water and Electricity Mix Well

Making the energy–water nexus a strategic reality begins with these tactical pursuits.

Visit the Water Energy Toolkit for information on:

- Improvements and upgrades to water systems
- Paying for energy-saving programs
- Pump, motor, metering, and control systems training
- Pursuing a foundation for ESPC activity in the water sector
- Encouraging private facility upgrades

It costs money to source, deliver, gather, and treat water, but with these resources facility owners and managers can perform upgrades beyond expansion and leak mitigation. Alex Boesenberg, Senior Manager, Government Relations

Mr. Boesenberg has two decades of experience in applied systems engineering practices.

<sup>1</sup> www.waterenergytoolkit.org

<sup>2</sup> energy.gov/eere/femp/energy-savings-performance-contracts

<sup>3</sup> www.dgs.ca.gov/dgs/Home/water.aspx

# Case Study: Wastewater Upgrades Save Energy and Taxes

#### Adding Value Through ESPCs

As energy efficiency gains increasingly more attention on local, national, and international fronts—often enabled and assisted by NEMA Member products many companies are opening business arms related to efficiency or founding new efficiency-minded businesses. The prime example of this is the energy service company (ESCO) model where business is generated in servicing, improving, and monitoring a building or facility or municipal power grid.

A favored vehicle to undertake capital improvements such as these is through an energy savings performance contract (ESPC) whereby the business performs retrofitting and improvements for no charge and in turn is awarded a percentage of the operating funds saved by the facility owner post-completion over a designated period of time.

ESPCs are attractive to federal agencies because they increase efficiency and thereby reduce their energy costs using private sector funding and expertise. Using an ESPC eliminates the need for appropriated dollars for equipment replacement and for operations and maintenance of the energy-using equipment.



Improvements at the wastewater treatment plant reduced energy use by 30 percent and solid waste by 20 percent. Photo courtesy of Johnson Controls

Evansville, the third largest city in Indiana, is part of a thriving community that serves as the commercial, medical, medical, and cultural hub for the Indiana/Kentucky/Illinois tristate region. To support the mayor's smart city initiative, the city entered into an energy savings performance contract with Johnson Controls, allowing the city to invest \$39 million in much-needed infrastructure without raising taxes.

The improvements started at the wastewater treatment plant and included both traditional and unconventional measures—energy-saving upgrades such as lighting, HVAC, controls, and power factor correction along with valve automation and a solid waste centrifuge—to reduce energy use by 30 percent and solid waste by 20 percent.

By generating power from restaurant commercial kitchen fats, oils, and grease, the process now supplies 40 percent of the energy at the plant. Across the city, a new automated metering system was implemented to increase meter-reading accuracy and efficiency by gathering real-time data from 64,000 meters throughout the city and from 10 wireless towers.

The energy-efficient upgrades will generate an estimated \$3.1 million in annual savings over the next 20 years for the city, positioning the Indiana city for future growth.

## **Case Study: School District Excels in Building Energy Efficiency**



#### CHALLENGE

When the East Syracuse Minoa Central School District (ESM) in East Syracuse, New York, approached Siemens for help in reducing energy costs in its seven schools and several district buildings, the request seemed fairly straightforward. However, the district wanted to not only fund the necessary building systems and energy-efficiency improvements through energy savings but also improve energy conservation efforts and incorporate alternative energy technologies.

ESM also wanted the facility improvement measures to provide energy awareness and education for its students, faculty, and staff and to create community awareness for its energy and environmentally responsible programs.

#### SOLUTION

To accomplish these collective goals, ESM entered into an energy savings performance contract (ESPC) with Siemens in 2008. The ESPC incorporated energy efficiency and building system improvements such as districtwide lighting and HVAC system retrofits, new windows and doors, and a new energy management system. It also included new boiler plants in four ESM buildings and a 25 kW on-site solar power system at the high school. "Since we were providing instruction in a digital age and in a global economy, we needed to design the building(s) to support a learning model that was focused on problem-solving, collaboration, critical thinking, creativity, and innovation," recalled Donna DeSiato, EdD, ESM superintendent. "The building redesign brought us not only into this century but also into a very clear future-thinking environment—all of which has certainly been cost-effective."

#### RESULTS

To date, ESM has realized more than \$500,000 in energy savings annually, exceeding yearly goals. The installed solar panels generate the same amount of energy as 141.5 acres of decade-old trees produce. Similarly, the new boiler plants save the district as much electricity as 6.2 average American homes usually consume over the course of a year.

"Lighting, air handling, heating, and cooling—all of the energy performance areas in every building are now state of the art," said Dr. DeSiato. "They're synchronized to perform so that the climate within a building is optimal for student learning."

To follow how facility improvement modifications have helped shape ESM's learning environment, visit www.usa.siemens.com/perfect-places-pinegrove.

#### FEATURE A BLUEPRINT FOR REBUILDING INFRASTRUCTURE

# Case Study: Dallas County Modernizes Infrastructure Without Raising Taxes

Tammy Fulop, Vice President, Schneider Electric

Ms. Fulop leads a team that delivers performance contracting solutions for municipalities, universities, schools, and hospitals as well as the federal government. As the ninth largest county in the United States with more than 2.3 million residents, Dallas County has undergone tremendous growth while establishing itself as a national leader. But to compete in a global marketplace, county officials knew they had to deliver what it takes to attract businesses of all sizes—workplaces with clean air and a vibrant economy. And they understood that change had to start with county buildings.

In 2011, the Dallas County Commissioners Court approved an aggressive efficiency program to

- lower operational costs;
- decrease energy use;
- increase sustainability measures; and
- enhance public image.

Dallas County officials partnered with Schneider Electric to implement a multiphase energy and infrastructure improvement project to address electrical distribution and energy-efficiency issues and improve safety and reliability of power across 54 county buildings.

Dallas County's big picture included a wide variety of infrastructure and energy-efficiency improvements, including

- lighting system upgrades with occupancy sensors and security features;
- building automation system installation;
- · HVAC system upgrades; and
- water conservation controls and fixtures.

![](_page_11_Picture_16.jpeg)

Thanks to an ESPC, Dallas County reduced its utility bills by 23 percent annually. Photo courtesy of Schneider Electric

The self-funding energy savings performance contract (ESPC) enabled Dallas County to modernize its infrastructure with energy-efficient equipment, providing an improved environment for employees and visitors while neutralizing the risk of system failures in critical facilities—all without raising taxes. According to the ESPC, the contract guarantees an amount of savings, and Schneider Electric will pay the difference if Dallas County does not realize that amount.

In total, the project reduces Dallas County's utility bills by 23 percent annually, which equals \$71 million in guaranteed energy savings over the term of the contract. The project has also made a significant environmental impact on the community by reducing carbon emissions by more than half a million tons the equivalent of planting more than 636,000 trees to restore the environmental balance. It is also giving a boost to the labor market by creating the equivalent of more than 630 local jobs and driving an additional \$90 million in business sales.

Dallas County has found a way to make a positive, lasting impact on the region without placing a tax burden on its residents. Officials would like the county's sustainability program to serve as a model for other municipalities nationwide.

# Case Study: Building Automation Teaches Efficiency

The Bielefeld University of Applied Sciences and NRW, a property management and construction company (BLB NRW), charted a new path in the construction of the University of Applied Sciences building on the Minden Campus of Bielefeld Technical College in Bielefeld, Germany. It integrates cutting-edge energy and automation technology and is a prime example of crossdiscipline, integrated construction.

The Minden campus has traditionally focused on engineering, including a master's program in integral construction. This brings architects, civil engineers, and project managers together to provide students with a foundation in construction planning across the building trades.

BLB NRW designed a four-story meeting center with offices, workspaces, a library, and a cafeteria that also functions as a research and teaching facility. Lighting, energy generation and distribution, air conditioning, and sun protection are

automatically controlled and monitored using building automation from WAGO that extends from individual systems to complete room automation. Students can learn about, program, and evaluate energy data directly via a communication interface in the network.

The Minden campus construction is one of two university buildings in the country that fulfills the high demands of energy efficiency class A, meaning no more than 50 kilowatt hours per year, in the form of electricity and heat, can be consumed per square meter.

"We were able to convince the university president that the higher efficiency class would benefit research and teaching," said Oliver Wetter, dean of the Minden campus. The decisive argument was that the investment more than pays for itself through operating cost savings over the lifetime of the building.

To increase energy savings, the building includes a well-insulated structural shell, recovers waste heat from the servers in the computer lab, and supplements with energy from a geothermal system. Its probes draw warmth from the earth that is transferred to a heat pump, which in turn increases the low temperature of the geothermic warmth to heat the building. Due to the reversible operation of the heat pump, the library, cafeteria, foyer, meeting areas, and workshop are cooled using the underfloor heating system and radiant ceiling panels—and energy extracted here is used to regenerate the ground probe field. Charlie Norz, Product Manager, I/O Systems, WAGO Corporation

![](_page_12_Picture_11.jpeg)

A second heat pump is linked into the combined storage for the server cooling/geothermic system and is also used for the combined heating system. A gas condensing boiler provides hot water and is reserved for

gas condensing boiler provides hot water and is reserved for peak loads. Cooling peaks are accommodated by two chillers. The entire system technology is designed to minimize primary energy consumption.

BACnet/IP controllers play a central role in plant and room automation. Twenty-one units are networked via an Ethernet system. BACnet, a standardized, open-source data communications protocol, enables data communication between devices from different manufacturers. Room automation includes lighting, sun shades, and room temperature regulation. Carbon dioxide air quality controllers are used in the practical labs and seminar rooms.

The Minden project demonstrates how energy efficiency can be sustainably improved thanks to state of the art technology.

![](_page_12_Picture_16.jpeg)

1111

Photos by Andreas Secci

![](_page_13_Picture_0.jpeg)

John Horsley, Past President, National Association of Counties Counties invest more than \$122 billion annually in Ctransportation and other infrastructure. Like their counterparts in federal, state, and city governments, county budgets are being squeezed. But funding is not the only challenge counties face.

For more information, visit www.naco.org/ topics/ transportationinfrastructure.

The National Association of Counties' (NACo) Transportation & Infrastructure initiative delves into how changes in technology will force county leaders to fashion answers to questions they've never even had to think about.

#### **Technology-Driven Transformation**

Electronic toll collection is one example of how technology is changing transportation. It enables drivers to pay without stopping at tollbooths. Another is changeable message signs that tell travelers when the next bus or train will arrive. Navigation systems provide turn-by-turn directions through satellite technology, and ride-hailing services like Uber and Lyft make it easier for millions of Americans to get where they want to go.

On the five-year horizon are automated and connected vehicle technologies. Self-driving cars and trucks will transform how Americans and our goods travel. Connected vehicle technologies will minimize vehicle crashes and reduce congestion. County decisionmakers need to understand what these technologies are capable of and how those capabilities can best be realized.

The challenge of electrification is similar to these. To start with, "electrification" is an issue that most county leaders have never heard of. But if it were rephrased as "U.S. energy efficiency will improve when we generate electricity using solar and wind rather than by burning coal, oil, and natural gas," then they might understand. If you added "by 2030, electric vehicles (EVs) may capture 50 percent of the new car market, and this will further reduce burning of fossil fuels," then a conversation may begin. Through its Transportation & Infrastructure initiative, NACo has used peer exchanges of county leaders, webinars, articles in *County News*,<sup>1</sup> and technical sessions at NACo conferences to give county leaders a better understanding of automated vehicles, regional freight planning, and road safety. The next step for NACo is to help its members understand the transition to electricity generated by renewable energy and the transition to EVs.

#### **Energy Revolution Underway**

Between 2009 and 2015, wind energy generation tripled, with 500 manufacturers in 43 states now supplying the wind industry. During that same period, solar energy increased twentyfold, and the cost of solar energy dropped by 70 percent. Today, there are four million Americans employed in renewable energy. In 2017, solar jobs were growing 17 times as fast as the U.S. economy. The fastest growing job that year was wind turbine technician.

California and New York have set goals to have 50 percent of their electricity produced from renewable sources by 2030. States from Maryland to Maine have agreed to a strategic electrification plan that calls for powering end uses like transportation with electricity instead of fossil fuels in a way that increases energy efficiency and reduces pollution, while lowering costs to consumers.

The fleet of electric vehicles in America has grown to 700,000, and the number of EV charging stations has increased to 16,000. Forty-five states have EV incentive programs. California's goal is to have 1.5 million zeroemissions vehicles on its roads by 2025; New York and seven other Northeast states have a goal of 3.3 million by 2025. But while important policy and funding support for EV fleet expansion has come from the federal and state levels, the delivery of these programs has taken place in counties and cities.

<sup>1</sup> County News, the official publication of the National Association of Counties, publishes news and ideas from Washington, D.C., and local county governments

A BLUEPRINT FOR REBUILDING INFRASTRUCTURE **FEATURE** 

#### **County Leadership**

NACo had to look no further for examples of county leadership on these issues than to its own executive officers.

In 2015, NACo Past President Riki Hokama of Maui County, Hawaii, described the JUMPSmartMaui Program as a partnership of Maui County and the state of Hawaii funded by a \$30 million grant from Japan's New Energy and Industrial Development Organization. The partnership's purpose is to identify how to build a smarter, more efficient electrical system that uses renewable energies such as wind, solar, wave, and geothermal and support expanded use of EVs.

In May 2017, NACo President-Elect Greg Cox, a supervisor in San Diego County, learned that his county had received a NACo Achievement Award for its EV program. San Diego has 7,000 plug-in EVs on its roads and has 455 public charging stations. This region has adopted the San Diego Regional Plug-in Electric Vehicle Readiness Plan and modified the county's building code to be solar and EV ready. ChargePoint, a manufacturer of electric vehicle supply equipment, announced a program to pay for free EV charging stations in San Diego apartment buildings. To encourage consumers to purchase EVs, San Diego Gas and Electric (SDG&E) announced a program that could boost incentives for an EV purchase to \$20,000: \$10,000 from SDG&E, \$2,500 from the state, and \$7,500 in federal tax credits.

There is little consensus among county officials on whether to generate electricity using renewable energy rather than fossil fuels or whether to support expanded use of EVs. Many counties are expanding the availability of charging stations so those who buy EVs have a place to plug in. Some do it to help reduce greenhouse gas emissions. Even more do it because it is a service that their citizens need and they believe their county is the best agency available to meet that need. 

#### **Driven by Industry, Not Government**

One transformation that became apparent in 2017 is that expanded use of EVs is happening faster than expected. This change will be driven by the global auto industry rather than by the U.S. government. Volvo has announced that beginning in 2019, all of the new models it produces will be electric or hybrid. Norway will end the sale of gas and diesel vehicles by 2025, Germany in 2030, the Netherlands in 2035, and the UK and France by 2040. China is pushing plug-in vehicles because it is struggling with catastrophic pollution levels in its major cities.

To remain competitive in the global marketplace, U.S. automobile manufacturers are going electric. General Motors's goal is to produce 20 all-electric models by 2023. Ford will invest \$4.5 billion in EVs by 2020. Toyota and Mazda will jointly develop electric vehicle technologies and build a \$1.6 billion assembly plant that can produce 300,000 EVs annually. Volkswagen plans to have hybrid or electric versions of all of its models by 2030. Toyota's goal is to produce all zeroemissions vehicles by 2050.

Elected county leaders need to understand the changes coming their way through electrification. A tsunami in EVs will require a massive increase in charging stations. Counties and cities must figure out how to make this happen. NACo looks forward to working with the electroindustry to educate county leaders all over the country on the changes coming their way.

#### Scott Ziegenfus

Manager of Government and Industry Relations, Hubbell Lighting

#### Lighting: Still Cool as Direct Response HVAC Strategy

n June of 2012, *electroindustry* magazine published my article, "Integrating Light Control into Your Company's Demand Response Strategy." At the time, facility managers frequently disagreed about how lighting could be an equivalent partner to HVAC in load shedding for demand response (DR) events.

The majority of facility managers considered HVAC the only option for DR because of the natural correlation with climate condition triggers. Lighting, on the other hand, was considered a steady event. Facilities would use the same light energy on a Tuesday in June as a Wednesday in November. Hence, facility managers naturally gravitated toward HVAC for DR.

My point was that lighting in an average commercial building was a larger part of the annual electricity used than HVAC. The 2003 U.S. Energy Information Administration (EIA) Commercial Buildings Energy Consumption Survey demonstrated that lighting accounted for 38 percent of the electricity used in commercial buildings. Ventilation, space heating, and cooling combined was a little more than 30 percent.

<ul> <li>Lighting</li> <li>S8%</li> <li>Cooling</li> <li>Ventilation</li> <li>Ventilation</li> <li>Refrigeration</li> <li>Personal Computers</li> <li>Space Heating</li> <li>Office Equipment</li> <li>Water Heating</li> <li>Cooking</li> <li>Model</li> </ul>	2003 Annual Electricity Use <sup>1</sup>			y Use <sup>1</sup>
<ul> <li>Cooling</li> <li>Ventilation</li> <li>Refrigeration</li> <li>Refrigeration</li> <li>Personal Computers</li> <li>Space Heating</li> <li>Office Equipment</li> <li>Water Heating</li> <li>Cooking</li> <li>1%</li> </ul>			Lighting	
<ul> <li>Ventilation</li> <li>Refrigeration</li> <li>Personal Computers</li> <li>Space Heating</li> <li>Office Equipment</li> <li>Water Heating</li> <li>Cooking</li> <li>1%</li> </ul>			Cooling	13%
Refrigeration12%Personal Computers5%Space Heating4%Office Equipment2%Water Heating2%Cooking1%			Ventilation	13%
<ul> <li>Personal Computers 5%</li> <li>Space Heating 4%</li> <li>Office Equipment 2%</li> <li>Water Heating 2%</li> <li>Cooking 1%</li> </ul>			Refrigeration	12%
Space Heating4%Office Equipment2%Water Heating2%Cooking1%			Personal Computers	5%
Office Equipment 2% Water Heating 2% Cooking 1%			Space Heating	4%
Water Heating2%Cooking1%			Office Equipment	2%
Cooking 1%			Water Heating	2%
			Cooking	1%
Other 12%			Other	12%

The argument was solid. Lighting *was* the single largest consumer of electricity in an average commercial building. A 2012 EIA survey,<sup>1</sup> however, showed lighting in these same facilities had decreased more than 50 percent, from 38 percent to 17 percent.

![](_page_15_Figure_9.jpeg)

In the nine years between studies, the introduction and enforcement of energy codes designed to reduce light power densities with the addition of more control technology significantly decreased lighting's contribution to a commercial building's electrical energy consumption. The lighting industry delivered on the promise of electrical energy savings far beyond other end-use contributors.

Now that LEDs have taken hold as the dominant light source with their low energy, long life, and high output capability, the electrical consumption of lighting might be at 15 percent or even lower. If that's the case, is the contribution of lighting marginalized when it comes to DR? Does lighting even still have a role in DR? And if it does, what is it since it's certainly not pure volume?

The answer is yes. Lighting may not be the dominant contributor but can be a significant complement by filling in the shortcomings of HVAC with its predictable, linear, responsive, and non-intrusive nature. An analogy is an old stereo amplifier; it had a knob for tuning and another for fine-tuning. The tuning knob would do the basic work of setting the sound. The fine-tuning would tweak for optimal performance. Lighting can be the facility's fine-tuning DR knob.

![](_page_16_Figure_1.jpeg)

#### LIGHTING MEASURES UP

Here's how lighting is different than HVAC:

#### Predictability

Unlike HVAC, lighting is shielded from many environmental influences. Daylight, or the contribution of the sun on room lighting, is the only environmental contribution that affects lighting. Daylight harvesting itself is predictable with the altitude and azimuth of the sun on any given day at any given orientation to a building. When you take into account that daylight harvesting affects only one of the multiple energysaving strategies used in a building, the effect is minimal, if nonexistent. Predictability facilitates the ability to map how much electricity can be curtailed through lighting at any time during a normal business day.

#### Responsiveness

Lighting is instantaneous to the human eye. The way HVAC deals with the thermal mass of a building is like a freight train. It starts slowly, but as it builds to a steady speed, inertia makes it difficult to stop. The same is true with the thermal mass and inertia in a building's HVAC controls. It takes time to recover desired temperature after a DR event, and if the recovery is pushed too hard, a spike in energy use can occur. Lighting gives that fast and exact response desired by the facility team to react, tweak, and counter small mistakes or unforeseen changes from a DR event with HVAC.

#### Linear

Lighting is linear—if you add current, you increase light, if you decrease current, you decrease light, proportionally. Controlling the thermal mass of a building is not a linear function. It takes time to reach temperature set point, and then it fluctuates around the set point. The linear nature of lighting allows for precise control that 40 percent reduction and 60 percent increase equals a set amount of light. This level of precise controllability affords

![](_page_16_Figure_10.jpeg)

lighting the ability to counter any mistakes in a DR/PDM program strategy or to make simple and quick tweaks any time of the day.

While predictability, linear operation, and responsiveness permit the facility team to work lighting easily into DR methodology, the nonintrusive nature of its cursory changes does not affect productivity. This comes from the human eye working increasing or decreasing its aperture like a camera. This function is automatic and unperceivable to the user but allows for a 15 percent or more decrease or increase in lighting to be unnoticed.

Studies by the Lighting Research Center at Rensselaer Polytechnic Institute<sup>2</sup> show that 80 percent of subjects accepted as normal up to a 30 or 40 percent reduction of light, and 50 percent could not detect a 15 or 20 percent reduction at all. This demonstrates that a facility can decrease or increase lighting to counter HVAC DR/ PDM measures without a negative impact on tenant comfort.

The industry has done a terrific job in decreasing lighting's energy use compared to HVAC in commercial buildings over the last 15 years. Its prominence in a DR strategy, however, has not diminished if it is used as a counter measure for DR events.

<sup>1</sup> https://www.eia.gov/consumption/commercial/estimation-enduse consumption.php

<sup>2</sup> www.lrc.rpi.edu/programs/lightingtransformation/loadshed.asp

#### **ADVOCACY**

#### **Infrastructure Moves to Center Stage**

NEMA joined business leaders and industry allies at the America's Infrastructure Summit hosted by the U.S. Chamber of Commerce in January to discuss modernization and electrification strategies that enhance efficiency, reliability, and safety. Participants also considered actionable ways federal policymakers, state officials, and the business community can advance infrastructure changes.

According to NEMA President and CEO Kevin J. Cosgriff, one focus of the association's policy work is to ensure that infrastructure is broadly scoped to include NEMA-friendly electrical grid, water systems, and buildings in addition to surface transportation enhancements.

"It is past time for Congress and the Administration to develop a broad-based infrastructure modernization strategy that includes not only roads and bridges but also ports, water systems, buildings, and the electrical grid," he said.

In NEMA's view, the infrastructure package should include federal and state funding, private sector incentives, and innovative policy changes that leverage multiple financing options. Achieving this goal requires a call to action for both the public and private sectors to invest in all segments of it. "Plans that utilize advanced, digitized electrification technologies will grow the economy, create new jobs, and improve our competitive position in a global economy," Mr. Cosgriff added.

The electrical grid is one of the nation's most important infrastructure assets. Every aspect of the U.S. economy and virtually every aspect of modern living depend on the reliable and affordable flow of electricity into homes and businesses.

During the recent State of the Union address, President Trump called for action to support \$1.5 trillion in infrastructure investment over the next ten years. He also called for streamlining the federal permit process so that these projects, such as power transmission lines, can be completed within two years if not sooner. NEMA has highlighted permitting delays in industry infrastructure discussions with elected officials.

How an infrastructure package is paid for and the makeup of federal, state, local, and private revenue sources will be a major challenge in getting a bill passed this year despite widespread agreement in Congress on its need.

NEMA and its Member companies will work this year to craft a package for legislative and executive action to support investments to modernize America's infrastructure.

#### **Speaking of the Electroindustry**

![](_page_17_Picture_12.jpeg)

Danny Abbate, NEMA's industry director of commercial products, presented "Digitize Everything! Capital Asset Management in the New Era of Electrification" at the annual meeting of the Independent Electrical Contractors in Las Vegas in January.

For more information, visit www.nema.org/book-a-speaker or contact book-a-speaker@nema.org.

Director, Federal Relations, MITA

#### **Congress Passes Two-Year Suspension of Device Tax**

A few days after the federal government shutdown in January, Congress passed legislation that suspended the medical device tax for two additional years and provided funding to reopen the government until February 8. The package, which also reauthorized the Children's Health Insurance Program (CHIP) and delayed the Cadillac and health insurance taxes, provided a vehicle for Congress to suspend the device tax after it failed to address the tax before December 31.

Although the tax went back into effect on January 1, companies were not required to pay it until January 29. In the interim, the Internal Revenue Service issued guidance that temporarily provided medical device companies with deposit penalty relief for the first three quarters of 2018, as long as companies made a good faith effort to calculate the correct payment amount. Passage of the two-year pause, which essentially extends the prior suspension passed in 2015 through 2019, is the result of an aggressive campaign by the Medical Imaging & Technology Alliance (MITA), a division of NEMA, to repeal the tax. Over the last two years, MITA Members and staff worked tirelessly to prevent the tax from restarting, effectively communicating the harmful effects of the tax during numerous fly-ins to Washington, D.C.; meetings with key lawmakers on Capitol Hill; and traditional and social media efforts.

MITA will continue to explore every opportunity to fully repeal the tax during the next two years. It has been meeting with congressional leadership, repeal-bill sponsors and co-sponsors, and other stakeholders to develop a repeal strategy.

#### Joseph Eaves

Director, Government Relations, NEMA

#### Advocating for High Performance Buildings in Infrastructure Legislation

NEMA and members of the High Performance Building Coalition (HPBC) hosted and participated in a Hill day on February 21 to promote the inclusion of several policies in the upcoming infrastructure package. The group visited offices of members of Congress who sit on the House Infrastructure Committee and the Senate Environment and Public Works Committee.

Including buildings in any infrastructure package would not only update the country's aging building stock but also pay for itself through increased economic activity. Recent studies show that every \$1 billion invested in nonresidential construction would add \$3.4 billion to the gross domestic product, add \$1.1 billion to personal earnings, and create or sustain tens of thousands of jobs. In the first quarter of 2016, the energyefficient appliance and building subsectors directly employed more than two million Americans.

The HPBC urges Congress to recognize buildings as a critical part of the nation's infrastructure as well as the roles they play in public safety, national

![](_page_18_Picture_13.jpeg)

security, and economic growth. The group also encourages Congress to ensure that opportunities to promote high performance and resilient systems in buildings, as well as retrofitting older buildings with these systems, are included in infrastructure proposals it considers.

Members of the HPBC who visited Congress February 21 included Harold Chase of National Science Foundation, Terry Hill of Passive House Institute, Cathleen DeLoach of the National Fire Protection Association, Joseph Eaves of NEMA, and Leanne Tobias of Malachite LLC. Photo by Christopher Lindsay, IAPMO

#### Ann Brandstadter

Manager, Standards Publications and Marketing, NEMA

#### **Terms and Definitions for Lighting Systems Published**

NSI C137.0-2017 American National Standard for Lighting Systems—Lighting Systems Terms and Definitions is a new lighting standard for lighting systems standards developers. The terms found in this new guide are common in multiple lighting systems standards and are recommended for use in all ANSI C137 standards.

"As additional C137 lighting system standards are created, revisions to C137.0 are anticipated so that it becomes the shared repository for lighting systems standard terms and definitions," said Michael O'Boyle, LC, technical coordinator for C137.0 and technical policy manager for standards and regulations at Philips Lighting.

ANSI C137.0-2017 is available for \$27 in hard copy or electronic download.

#### OTHER RECENTLY PUBLISHED STANDARDS

ANSI C136.10-2017 American National Standard for Roadway and Area Lighting Equipment—Locking-Type Photocontrol Devices and Mating Receptacles—Physical and Electrical Interchangeability and Testing allows physical and electrical interchangeability of devices for outdoor lighting. Revisions include improved diagrams, updated references and definitions, and revised requirements. It is available for \$69 in hard copy or electronic download.

ANSI C18.4M-2017 American National Standard for Portable Cells and Batteries—Environmental applies to all chemistries of portable primary cells and batteries standardized in the ANSI C18 series. This latest edition includes details for article information sheets and a compliance checklist. It is available for \$103 in hard copy or electronic download.

#### SPOTLIGHT

![](_page_19_Picture_11.jpeg)

William (Bill) Finley, Senior Director of Technology, Siemens Industry, Inc.

#### I Am the Electroindustry

have been working behind the scenes for 35 years developing, improving, and harmonizing electric rotating machine performance and energy conservation standards within NEMA, the IEC, and IEEE and have held many officer positions in all three standards organizations.

Not only have I been involved in the Motor and Generator Section, but I have also worked in global harmonization through my work in CANENA, the IEC, and harmonizing IEEE standards with IEC standards. This has given me the unique opportunity to harmonize standards globally. There are many performance and economic benefits for manufacturers and end users in having one design that can be developed, proven, verified, and then used globally. A few recent successes include the harmonization of efficiency (energy conservation), testing, and vibration standards. I continue to educate the user community by presenting these topics in more than 30 papers, many of which have won awards. In addition to my prestigious elevation to IEEE Fellow, I am also honored to have been named a Siemens Innovator of the Year.

Especially because of my work in harmonization, I am proud to be a member of the electroindustry.

#### STOCKART

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Northeast Field Representative, NEMA

#### **Catching Up in 2018**

While several states in the Northeast have moved toward adopting the 2017 *National Electrical Code*<sup>\*</sup> (NEC), 2018 will be an active year in Pennsylvania and New York City, areas that recently chose to make the three-year adoption

#### PENNSYLVANIA

important for their citizens.

Pennsylvania's Act 36 will make the process more open, less cumbersome, and tied to a mandated timetable that will ensure consistency from cycle to cycle and help the Uniform Construction Code (UCC) Review and Advisory Council (RAC) evaluate building and fire codes.

The difficulty has been the language in approving changes to the UCC as they relate to the family of International Code Council codes (I-Codes), which are published every three years. The RAC had to approve every change by a two-thirds vote. When it rejected the 2012 code in its entirety, the state had to retain the 2009 I-Codes and 2008 NEC. This havoc also occurred during the 2015 I-Code review. Special interest parties also opposed the movement to three-year updates.

Which brings us to today! The new statute allows the RAC to re-review the 2015 I-Codes and bring all previous versions into the process. Changes to the 2015 and 2012 I-Codes will be reviewed together so the RAC can submit a comprehensive report to the legislature. The public comment period and public hearings will be abbreviated to meet the timelines set out in Act 36. The anticipated adoption is October 2018.

The RAC will then prepare for the review of the 2018 I-Codes and keep to the three-year cycle. The delay of starting the process was built

![](_page_20_Picture_9.jpeg)

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into Act 36 to allow the construction industry time to adjust for upcoming changes. The 2014 NEC is a reference document in the International Building Code<sup>\*</sup> and will be adopted through this process with no amendments. The electrical section in the International Residential Code<sup>\*</sup> has been under scrutiny and will be reviewed.

#### **NEW YORK CITY**

New York City's Department of Buildings (DOB) announced a yearlong process in which the city's electrical code will be revised through the official rules process. NYC is now enforcing the 2008 NEC with specific amendments unique to the metropolitan area. The city will use the 2014 NEC as the base code for the next version of its electrical code. The DOB also announced that it will attempt to stay on the three-year cycle to keep up to date with the more innovative and complicated electrical systems within the city.

The NYC DOB will create several code review technical panels for specific topics. Amendments and rules that deal with products with installation limitations or prohibitions will be re-evaluated to see if product changes have addressed the original concerns of the restrictions. The review process is anticipated to take a year to complete.

#### **ELSEWHERE IN THE NORTHEAST**

Delaware, Maryland, and New York state will be in their three-year reviews. Connecticut is in the middle of its review with a public comment period open for the 2018 I-Code and 2017 NEC review.

#### **Puerto Rico Reconstruction Continues**

As Puerto Rico continues to rebuild its electrical infrastructure, the NEMA staff of experienced engineers and electroindustry experts has provided lawmakers and local officials with recommendations and guidance documents for a more robust approach to electrical preparedness and recovery. Visit the Storm Reconstruction Toolkit, available in both English and Spanish, for information on how today's technologies can provide safer, more reliable, and resilient power systems.

#### Joel Solis

Senior Manager, Conformity Assessment, NEMA Director, Trade and Commercial Affairs, NEMA

Craig Updyke

#### **Regulations Act as Access Barriers**

A s economies develop, consumption of manufactured goods increases, often leading to import competition. While governments may seek to protect their citizens from substandard, inferior goods and ensure orderly competition by imposing regulations, conflicts often occur when regulation imposes burdens far in excess of global norms.

One example is playing out now in the Republic of South Africa, which last autumn cited its consumer protection law as the basis for immediate implementation of a new and costly system for compatibility certification of "nontelecommunications electronic and electrical products" that may emit electromagnetic interference (EMI).

![](_page_21_Picture_7.jpeg)

While the regulation ensnares a broad range of products, it tries to solve a problem with counterfeit products by imposing a requirement for EMI testing by a laboratory accredited by South Africa Bureau of Standards (SABS) instead of taking direct action at the border. In summary, the new system places SABS at the head of a new "authorized laboratory program," but the lack of transition time, requiring laboratories to be directly

accredited by SABS, the imposition of additional costs for accreditation, and inattention to international and alternative solutions are causing concerns and likely will not solve the issue with counterfeit products.

#### **REGULATION WITHOUT RESTRICTION**

International trade rules specify that governments inform each other of proposals for new or modified technical regulations that could act as barriers to foreign products and accept input from interested parties. The rules also encourage governments to choose an approach that achieves well-founded regulatory objectives without unnecessarily restricting trade.

Electrical and medical imaging equipment are frequent subjects of such notifications, which are distributed by the World Trade Organization (WTO) and national-level enquiry points such as the National Institute of Standards and Technology (NIST). NEMA tracks notices closely and works with its Members to provide written comments.

A 2016 paper issued by the U.S. Department of Commerce found that technical regulations of which WTO members had been notified could be linked to 90 percent of U.S. goods exports. Leaving aside any regulations and proposals that countries fail to distribute under the WTO Agreement on Technical Barriers to Trade (TBT), the author concluded that technical regulations, "especially those [that] are based on national or regional standards instead of on international standards can create additional costs for exporters as they seek to adapt their products and processes to differing regulatory requirements around the globe."

In the case of South Africa's September 2017 notice on EMI and electromagnetic compatibility (EMI/ EMC), the government's objectives in immediately adopting a new conformity assessment and certification system include protection for public networks and consumers, ensuring products entering the market meet required standards, and "traceability of actual testing samples and address[ing] changes to critical components in electrical and electronic products." The Department of Trade and Industry and the Independent Communications Authority of South Africa (ICASA) cited urgent safety, health, and environmental problems and asserted that any delays in implementation could necessitate a cessation of imports.

NIST forwarded NEMA's concerns to South Africa regarding its requirement to directly accredit EMI testing laboratories, citing certification cost increases of as much as 400 percent, possible alternative approaches to direct accreditation, and lack of clarity as to the precise product scope of the new requirements. Commerce Department officials have requested answers from counterparts in Pretoria, Johannesburg, and the South African embassy in Washington, but at this time no resolution has been reached. So far, only one U.S.based laboratory has received SABS approval.

The U.S. and other member states are expected to invoke complaints about South Africa's EMC approach at the March meeting of the WTO TBT Committee in Geneva, Switzerland.

#### **Positive Streak Continues**

The current conditions component of the Electroindustry Business Confidence Index (EBCI) moved up from 66.7 in December to 71.4 in January. Fully one-half of the survey panel noted better conditions as the share of those indicating an unchanged business environment declined. Although the proportion of respondents reporting worse conditions edged up, one such Member's comment made it clear that January was worse only because the previous month was "amazing."

The expansionary reading of current conditions in January marked the 16th consecutive month this component topped 50, making it the longest such stretch since before the last recession. It is worth noting that this upbeat sentiment has yet to materialize in hard data for some segments of the electroindustry, such as lighting and manufacturing-related equipment, which experienced declining shipment numbers reported by the U.S. Census Bureau on a year-over-year basis for most of 2017.

The reported intensity of change in electroindustry business conditions increased according to one measure this month as the mean grew from 0.6 in December to 0.9 in January. The median value once again held steady at 1.0 this month. Panelists are asked to report intensity of change on a scale ranging from -5 (deteriorated significantly) through 0 (unchanged) to +5 (improved significantly).

The future conditions component edged down from last month's 73.3 to match the current conditions number at 71.4. The underlying responses moved only incrementally, with the share of better responses edging down, worse responses ticking up, and unchanged responses remaining the same as in December. Regardless of the slight decline, January's results indicated considerable optimism for business conditions in six months.

Visit www.nema.org/ebci for the complete January 2018 report. ©

	Current Conditions (Compared to Previous Month)	Conditions Six Months from Now (Compared to Current Conditions)
EBCI	71.4 🔺	71.4 🔻
% Better	50% 🔺	50% 🔻
% Worse	10% 🔺	10% 🔺
% Unchanged	40% 🔻	40% 💻

![](_page_22_Figure_10.jpeg)

![](_page_22_Figure_11.jpeg)

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![](_page_23_Picture_2.jpeg)

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