ENERGY OBSERVER

A MONTHLY NEWSLETTER FROM AMERLUX®

Amerlux Corporate Video

At Amerlux, we create bold lighting solutions that add warmth and brilliance to the world. As a design-and-manufacture company we build long-term relationships with architects, facility managers and lighting designers by taking every complex problem personally. Our award-winning portfolio includes innovative interior and exterior lighting products that deliver striking aesthetics and rich performance through advanced engineering. For more information, please visit http://www.amerlux.com/ or https://www.youtube.com/watch?v=8RMZpOOp3Qo&feature=youtu.be

LED Energy Market Observer:

1. **NEMA Publishes New Performance Requirements for Electric Lamps** - This revised standard contains performance requirements for the compliance of self-ballasted compact fluorescent lamps up to 60 W. ANSI C78.5 is intended for domestic and similar general lighting purposes. ANSI C78.5-2017 is available in hard copy or as an electronic download for $56 on the NEMA website.

2. **DOE Comparing Measures of Average Color Fidelity** - IES TM-30 Color Metric to Widely-Used CRI Ra - The introduction of new measures of color rendition has stirred debate within the lighting industry on the relative merits of the tools, as well as the amount of difference between the new tools and prior tools, such as CIE Ra. This article focuses on comparing three measures of average color fidelity: IES Rf, CIE Ra, and CIE Rf. Using a large set of commercially available, experimental, and theoretical spectral power distributions (SPDs), the analysis contrasts past efforts to make similar comparisons using smaller or more focused datasets. It highlights the interactive effect of gamut shape and color space non-uniformity, which results in a range of IES Rf values of at least to 50 to 86 for SPDs having a CIE Ra value of 80. It also examines how these differences can be overlooked in psychophysical experiments relying on a small number of SPDs, which can present misleading findings on the value and meaning of the measures. When considering the results, it is important to remember that average color fidelity is only one aspect of color rendition. https://www.energy.gov/sites/prod/files/2018/01/f46/Royer_LEUKOS_Dec2017.pdf

3. **2018 LED Rebate Amounts Start to Level Out** - Historically, rebates for LED lighting have decreased 10 - 20% every year. This year, the rebate amounts have started to level out; the average prescriptive rebate for LED only went down 1% across all product lines. That being said, some specific products saw some big changes. LED Linear Tube Replacements dropped by 19% and screw-in HID replacement lamps by 35%. These decreases likely reflect the changing price in the marketplace as the costs of those solutions have also decreased significantly in the past year. In contrast, rebates for LED downlights and linear panels (2x4's) went up 5% and 10% respectively.
   - Rebates For DLC Standard vs Premium
   - Control Rebates Are Strong As Ever
   - What's Next? Biax / PL-L Lamps & 8' tubes

http://briteswitch.com/news/2018RebateTrends.html

4. **Bringing Interoperability to Light** - Silvair announces partnerships with Fulham, McWong International, Murata, Danlers, ERP Power and DG Light to bring to the market a wide range of components and products designed for setting up smart lighting infrastructures in commercial spaces. Silvair's wireless control technology allows a variety of drivers, fixture controllers, sensors, switches, LED engines to become part of a global smart lighting ecosystem driven by the Bluetooth mesh networking standard. Bluetooth advancements such as unmatched scalability, wired-like reliability and high-level security make a solid foundation for smart lighting solutions. The appearance of products empowered by Bluetooth mesh indicates that the market is now ready for open wireless lighting control solutions. It also shows how fast the market is adopting the Bluetooth mesh standard. All of the above-mentioned products will be compatible with energy harvesting wireless switches made for quick and intuitive control of connected lighting systems due to Silvair's collaboration with EnOcean. https://www.ledinside.com/

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5. **Surf City Gets Smart Lights** - The popular surfing town of Huntington, California, is becoming the first city in world to install new hybrid streetlight and cellular transmitters with built-in 5G masts. The so-called Smart Fusion Poles are of a heritage design but boast a host of high tech capabilities, including intelligent sensors that can detect traffic conditions, parking spaces, and air quality, all connected to central information points and the cloud for distribution to individuals, city managers. The light fittings – the result of a joint venture between Philips and Boston-based wireless communications specialist American Tower Company – are expected to be installed along the city's coastal highway, Highway 1. A further tranche of fittings will illuminate the lively downtown area of shops, cafes, restaurants, and bars. http://luxreview.com/article/2018/02/5g-smart-lights-for-surf-city

6. **Three Smart Building Technologies Offer New Energy Management Choices** - This year, the smart buildings market is estimated to become a $50 billion industry, according to Research and Markets. This growth is being driven by numerous factors, including the falling prices of Building Internet of Things (IoT) devices, a new generation of facility managers, regional mandates, and more. Let's look at three smart building technologies that offer new energy management options.
   1) Digitization of Physical Assets - A robust digital twin will be composed of occupancy, comfort, thermal, and weather models.
   2) Growth of IaaS - Building IoT infrastructure installed within a facility does not make a building smarter by itself. This has led to the emergence of Insight-as-a-Service across numerous industries.
   3) Prioritization of Tenant Comfort - Building automation is gaining a people-centric focus. https://www.facilitiesnet.com/

7. **City of Charlotte, North Carolina LED Street Lights Found to Interfere with Toll System During First Part of LED Light Installation** - City planners of Charlotte, North Carolina, have apparently made a mistake in the type of LED lighting that they chose for illuminating I-77. The lighting is part of a statewide plan to replace outdated lights with LED lighting along interstate highways. The city found out in the early stages of installation that the LED street lights that they have begun installing interfere with the tollway driver identification system, according to a report from Eye Witness News WSOCTV. Parts of I-77 have been under construction for many years. And proper lighting is necessary to allow people to traverse the construction zones. However, just as the construction is about to be completed, the city noticed that the lighting interferes with the tollway system. http://www.solidstatelightingdesign.com/

8. **PoE Connected Lighting System Energy Losses in Ethernet** - DOE has released the results of an exploratory study investigating energy losses in Ethernet cables used between Power over Ethernet (PoE) switches and luminaires in PoE connected lighting systems. Testing was conducted at DOE's Connected Lighting Test Bed in September 2017. A test setup comprising a PoE switch, a set of luminaires, and a reference meter was used to test nine cable models of varying design. Power measurements for two widely differing cable lengths – one near 50 m and another near 0 m – were used to determine the portion of PoE switch output power dissipated by each cable model. The results were analyzed to explore the impact of cable selection on PoE lighting system energy efficiency, as well as the effectiveness of guidelines recently introduced by the American National Standards Institute (ANSI) C137 Lighting Systems Committee. The key finding is that the guidance offered in ANSI C137.3-2017 does appear to be effective in limiting cable energy losses to 5% in PoE lighting applications, provided that the average cable length on a project does not exceed 50 m. https://www.energy.gov/eere/ssl/articles/poe-connected-lighting-system-energy-losses-ethernet-cables

9. **Major Study Finds Lighting Cut Crime by 39%** - In partnership with the Mayor's Office of Criminal Justice, the New York City Police Department and the New York City Housing Authority, the scientific research team Crime Lab designed a six-month randomized controlled trial involving nearly 80 public housing developments, all of which had elevated levels of crime. About half of the developments received new, temporary street lights, and half did not. The study found that the developments that received the new lights experienced crime rates that were significantly lower than would have been the case without the new lights. Among other findings, the study concluded that increased levels of lighting led to a 7 per cent overall reduction in so-called index crimes— a subset of serious offences that includes murder, robbery and aggravated assault, as well as certain property crimes. Specifically, at night there was a 39 per cent reduction in index crimes. http://luxreview.com/

10. **New Roadway Lighting Standard for Enclosed Pendant-Mounted Luminaires** - NEMA published ANSI C136.53-2017 American National Standard for Roadway and Area Lighting Equipment—Enclosed Pendant Mounted Luminaires. Developed by the ANSI Committee for Outdoor Lighting, this new standard for roadway lighting covers dimensional, maintenance, and light distribution features that are interchangeable in enclosed pendant-mounted luminaires. Luminaires of similar size, shape, and weight meeting the requirements of this standard may be used interchangeably within a system with the assurance that: ANSI C136.53-2017 is available electronically for $40.
- They will fit the mounting pendant
- Pole strength requirements will not change
- Light distribution will be similar
- Similar maintenance procedures can be used

11. **Designing a Smart Lighting Plan: Voice Control, Presence Detection, & Light Switches by Andrew Weinreich** - What are the benefits of having your home's lights on the network? The most obvious use case is that, when you're away from home, you can turn your lights on or off. But you can also imagine how a really smart system knows that, when you get into bed, it should turn off the lights in the rest of your house. Or you can imagine how, in a security context, if a sensor on the outside of your house notices suspicious movement, it might turn on the lights to mimic your presence. In the case of smart lighting, the fight for supremacy won't simply be a function of user interface or distribution. Instead, the winner in smart lighting actually might be based on which company possesses the right vision determining how your entire lighting system is set up. What if the room just knew you were in it and turned on the lights for you? Could we ever get to a place where there would be no light switch in the wall and the home would simply understand our intentions before we articulated them? https://www.forbes.com/

12. **Lighting Research Center Releases Video Series on Light and Health** - The Lighting Research Center (LRC) at Rensselaer Polytechnic Institute has released a series of short videos on the science of lighting for human health. The videos are now available on YouTube and on the LRC website.
Three videos are currently available:
1) Circadian Rhythms. A brief overview of human circadian rhythms, why they're important, and the need for staying en trained with lighting.
2) Circadian Stimulus. A brief overview of circadian stimulus (CS), a metric developed at the LRC to quantify the extent to which lighting impacts the human circadian system. Learn about the role light levels and spectrum play in CS, and the impact of other qualities of lighting on the circadian system.
3) Circadian Stimulus Calculator. How to use the LRC's circadian stimulus calculator, which quantifies CS provided by one or more light sources. The calculator is available at http://www.lrc.rpi.edu/cscalculator/
A total of nine videos are planned for release this year, covering topics such as how to provide healthy lighting for office workers, lighting in schools, and the future of circadian lighting. http://www.lrc.rpi.edu/programs/lightHealth/index.asp

13. **For Rent: Lighting as a Service by Chuck Ross** - A combination of rapidly advancing technology and a change in U.S. accounting standards is encouraging a new business model for financing lighting and other energy-system upgrades. It's not often that electrical contractors pay much attention to accounting practices beyond their own tax reporting. However, in this case, taking a little time to get up to speed on commercial lease accounting could open the door to lucrative business opportunities in today's evolving lighting and controls markets. The new approach to lighting ownership, called "lighting (or lumens) as a service" (LaaS), is coming to the fore thanks to three unique trends. The first is the rapid deployment of new LED lighting equipment, driven by falling prices and performance that meets or exceeds legacy fluorescent and HID systems while using significantly less energy. Second, there is a parallel interest in increasingly affordable sensors and controls, both to meet stringent new energy codes and make use of the broad range of data-collection capabilities sensors provide. The third is a move to change how businesses account for equipment leases in their balance sheets, which is making service agreements more attractive than leases when it comes to financing new equipment purchases. https://www.ecmag.com/section/lighting/rent-lighting-service

Global LED Energy Market Observer:

14. **Pitch Lights Will Be LED, Says Spurs** - NORTH LONDON soccer team Tottenham Hotspur has confirmed that its pitch will be lit by 324 LED floodlights. The lighting at the ambitious £850 million ($1.2 billion) stadium has to comply with tough television standards for both the Premier League and the US National Football League, whose games it will host. The LED luminaires will be mounted in groups of six on 54 rooftop columns. The roof consists of glass panels that angle over the stands but leave the playing field open. But Spurs, as the team is popularly known, declined to reveal the lighting supplier. Recent suppliers to Premier League teams include Philips Lighting and US manufacturer Musco. http://luxreview.com/article/2018/03/pitch-lights-will-be-led-says-spurs

15. **California Indoor Farming Startup Plenty Plans to Launch Global Operations in China and Japan** - Ambitious U.S. indoor farming startup Plenty is seeking urban sites for new farms in Chinese cities as part of a global drive to set up high-tech facilities growing organic vegetables in warehouses under banks of LED lights. Matt Barnard, chief executive of the San Francisco-based firm which counts Amazon founder Jeff Bezos and Japanese tech player SoftBank among its backers, told Reuters on Wednesday that China could potentially host at least 300 of Plenty's farms. The firm currently operates just one farm, in San Francisco, with another due to open in Seattle in the first-half of 2018. Plenty's farming model means growing vegetables and herbs on vertical towers indoors, with hydroponic systems delivering nutrients to plants and LED lighting designed to stimulate rapid growth all-year round. Enclosed farms reduce pests and allow the firm to optimize growing conditions. http://fortune.com/2018/01/17/indoor-farming-startup-plenty-china-japan/?iid=sr-link2

16. **Virgin Media Samples Standard Electrical Wires for IoT Lighting at Technical Center** - British broadband and cable provider Virgin Media is sampling the use of standard electrical wires to transport data to and from luminaires in order to control lux levels and collect information about facility usage at a technical center. The small powerline communications (PLC) trial has cut lighting-related energy costs by 99%, according to enModus, who replaced a number of fluorescent lights with LED luminaires from Thorn and tied them into enModus' Wattwave control system that delivers commands from a central hub to the lights, each of which is outfitted with an enModus node. The hub also connects via the Internet to an enModus cloud computing system based on Microsoft Azure, which helps to analyze lighting use and which sends back adjustments to the controls. In addition to lighting information, the lights deliver occupancy information — picked up from embedded PIR sensors — which the cloud system examines to help facility operators make better use of their space. Both PLC and PoE technology can also deliver data to devices other than lights, providing rounded Internet of Things (IoT) connectivity. They are both competing with a variety of wireless approaches, such as Bluetooth Mesh. http://www.ledsmagazine.com/

17. **Philips Lighting Announced That Their New Name Is To Be Signify** - It was decided that the company should get a new name because light has become 'intelligent'; it connects people and systems and transfers information. The company will keep carrying the Philips brand name according to the current licensing agreement with Koninklijke Philips because Philips is the most recognized brand name for lighting in the world. The Philips Lighting stock exchange ticker will remain LIGHT. http://www.newsroom.lighting.philips.com/news/2018/20180316-philips-lighting-will-become-signify

18. **Global Outdoor LED Lighting Market – Industry Trends and Forecast to 2024** - The Global Outdoor LED Lighting Market accounted to USD 26.0 billion in 2016 growing at a CAGR of 12.8% during the forecast period of 2017 to 2024. The upcoming market report contains data for historic years 2015, the base year of calculation is 2016 and the forecast period is 2017 to 2024. On the basis of geography, outdoor LED lightingmarketreport covers data points for 28 countries across multiple geographies. Some of the major players operating in outdoor LED lighting market are Philips, General Electric, Osram Licht AG, Cree, Inc., Eaton, Hubbell, Dialight PLC, Zumtobel, Syska LED, Virtual Extension, Neptun Light, Inc.,Tapan Solar Energy, Tanko Lighting, Evluma, GOOEE, UM Green, Solas Ray, others. http://databridgemarketresearch.com/reports/global-outdoor-led-lighting-market

19. **Zhaga and DiiA Agree to Cooperate on IoT Solutions for Lighting** - As lighting controls become more digitalized and the Internet of Things takes off, the need for defining standardizing the interface of sensors and connectivity modules with lighting has become a widely known issue in the lighting industry. Two organizations, Digital Illumination Interface Alliance (DiiA) and the Zhaga Consortium (Zhaga) are creating technology and devising standards for this area. DiiA is an open, global consortium of lighting companies that intend to grow the market for lighting-control solutions utilizing the Digital Addressable Lighting Interface (DALI) technology. Zhaga, is a global association of lighting companies that standardizes interfaces of LED luminaire components, such as LED modules, LED light engines, LED arrays, holders, electronic control gear (LED drivers) and connectivity fit systems. http://www.solidstatelightingdesign.com/zhaga-diia-agree-cooperate-iot-solutions-lighting/

20. **Welcome to The University Without Light Switches** - Students attending Dubai's Hamdan Bin Mohammed Smart University (HBMSU) need never flick a light switch or search for a tutorial or classroom again. The facility has been equipped with state-of the-art lighting controlled by a cloud-based technology. It enables faculty staff to control and personalise light settings using a smartphone app, while students can be guided to rooms using lighting-based indoor positioning technology. Instead of using light switches, HBMSU's lighting is controlled in a variety of ways: by occupancy sensors in luminaires that detect people's presence, switching on and off lighting; by automatic adjustment of light levels according to the availability of natural daylight; by a smartphone or tablet app; or from a central console. Also, the heating, ventilation and air conditioning (HVAC) system is synced with the class schedule so that air conditioning is switched on before a class starts and students don't have to enter a warm room. The indoor navigation service uses the university's smartphone app. LED light points, installed in the hallway, lobby areas and corridors, transmit a light code containing their individual geographical location. http://luxreview.com/article/2018/03/welcome-to-university-without-light-switches

21. **Smart Lights Will Monitor Wind, Traffic, Waste and Air** - A street lighting installation in England will feature 'super smart' luminaires which will monitor their environment. The light fixtures in Essex and Hertfordshire will:
- look for blocked street drains and even predict flooding it happens
- instantly alert the highways team of high winds, and predict dangerous driving conditions
- measure traffic flows and dim unnecessary streetlighting on empty roads
- monitor how full waste bins are
- detect air quality and supply street-by-street status reports

Oh, and they'll illuminate the roads. The project, a partnership with Cambridge-based technology firm Telensa, will assess the potential quality-of-life and economic benefits of a range of smart city technologies. http://luxreview.com/

22. **Data Is the New Lighting as Philips Unfurls IoT Platform** - In the biggest declaration yet that the Internet of Things represents the industry's future, the world's largest lighting company, Philips Lighting, unveiled an IoT platform that turns lighting into a byword for collecting and analyzing data about everything, everywhere. Sounding as much the head of an IT company as a lighting company, CEO Eric Rondolat repeatedly emphasized the importance of data acquisition and analytics in introducing the new lights-to-cloud-and-back capability, called Interact. Interact puts sensors and chips into lights and the lighting infrastructure to spot activity such as room occupancy, road traffic, and air quality. It connects this information through wired and wireless communication networks to a cloud computing system that provides analysis such as how to better use space inside a commercial building, and how to improve the flow of cars on a highway. The company is showing all of the new IoT wares and services, including Interact, at the Light+Building trade fair in Frankfurt. http://www.ledsmagazine.com/articles/2018/03/data-is-the-new-lighting-as-philips-unfurls-iot-platform.html

23. **Connected Lighting Boosted Sales with Key Customers** - The giant E.Leclerc retail store in Langon in southwestern France has reported that revenue rose between 34 per cent and 42 per cent from certain customers who over the last few months wirelessly connected their smartphones to Bluetooth-equipped ceiling lights delivering discounts and information. The 800 LED luminaires are equipped with Bluetooth beacons for indoor positioning to transmit information such as product offers and location to customers' phones. The customers had agreed to tie the app into their E.Leclerc loyalty schemes, so E.Leclerc can tailor specific messages to individual interests and buying habits. Customers can also request missing products when they're in the store. E.Leclerc notified 2,260 customers about the opportunity to tap into the system. Of those, 1,119 downloaded the app. Of these, 771 customers actually used it to access the IoT lighting system at the 75,000-ft2 outlet. http://luxreview.com/article/2018/03/connected-lighting-boosted-sales-with-key-customers

24. **Osram and Nichia Announce to Expand IP Co-operation** - OSRAM GmbH and Nichia Corporation have entered into patent cross license agreements in 2002 and 2010. As a result, both companies are allowed to use each other's patents licensed under the respective agreement in its own nitride-based semiconductor products such as blue, green, and white LED and laser components. The two companies now agree to enter into negotiations of a cross license covering approximately 7000 new patent applications including approximately 2000 granted patents from Nichia and Osram (all figures are worldwide figures), covering Automotive, General Lighting, LCD backlights, Display, Medical and Industrial applications and full range of opto-electronics products. https://www.osram.com/os/press/press-releases/osram-and-nichia-announce-to-expand-ip-cooperation.jsp

National Energy Market Observer:

25. **NEMA White Paper Explains the Fluorescent Ballast Rule** - NEMA LSD 66-2017 Understanding the Fluorescent Ballast Rule, EPCA 10 CFR 430. "This white paper updates a 2012 ballast ruling, which became effective in 2014, and offers historical context for the current use of the ballast luminous efficiency metric," said Ed Thomas, chair of the NEMA Ballast & Driver Section Technical Committee. This revision of LSD 66 contains updated language. NEMA LSD 66-2017 is available as an electronic download at no cost on the NEMA website.

26. **What's New in LEED: LEED v4.1** - LEED v4.1 will be new, improved and agile, ensuring we deliver on the vision of green buildings for all. At Greenbuild Boston, attendees learned about LEED v4.1—a critical step in the evolution of the rating system, building on lessons learned and impact areas highlighted in LEED v4. This update is being designed to ensure that we continue to deliver on the vision of green buildings for all. It also means that as we work toward this goal, we are paying close attention to ensuring that these buildings perform and that they fulfill the promise of their design. For existing buildings, LEED v4.1 will be new, improved and agile to make it easier for every type of existing building to achieve LEED certification or be on a path to do so. In the first quarter of 2018, USGBC will release a draft for LEED v4.1 O+M for review. This will be followed by BD+C, ID+C, Residential and ND. https://www.usgbc.org/articles/whats-new-leed-leed-v41

27. **Chinese Firms Prepare Bids for GE Lighting Ops** – Sources – (Reuters) - At least two Chinese companies are preparing bids for industrial conglomerate General Electric's remaining lighting assets in a potentially $1 billion deal, according to people familiar with the situation. MLS Co and Foshan Electrical and Lighting Co , both lighting manufacturers based in southern China's Guangdong province, have been in talks with lenders to finance a potential bid for the asset, one of the people said. Shedding the remaining, mainly U.S.-based lighting business is part of a broad restructuring plan aimed at divesting $20 billion worth of assets to focus the remaining company on three core divisions: power, aviation and health care. Profit at GE's lighting business fell sharply last year. It earned $93 million on revenue of nearly $2 billion in 2017, down from $199 million on $4.8 billion in 2016. The U.S. lighting activities will also be shopped to peers such as Cree, Acuity, Leviton, Hubbell and Eaton. https://finance.yahoo.com/news/chinese-firms-prepare-bids-ge-130413200.html

28. **2018 Nonresidential Construction Forecast: Positive Growth** - The U.S. economy grew by 2.5% in 2017, outpacing 2016, and is expected to produce similar growth in 2018. A major contributor to the economy is construction, and the outlook for construction spending in 2018 overall is positive, particularly nonresidential. The AIA's semi-annual Consensus Construction Forecast, a survey of the nation's leading construction forecasters, is projecting 4% growth in nonresidential construction spending in 2018 and 3.9% in 2019. http://lightingcontrolsassociation.org/

29. **Americans' Electricity Use Just Keeps Falling** - There's not a whole lot new to say about what's causing it: mainly increased energy efficiency (driven to a remarkable extent by the rise of LED light bulbs), and the continuing migration of economic activity away from making tangible things and toward providing services and virtual products such as games and binge-watchable TV series (that are themselves consumed on ever-more-energy-efficient electronic devices). https://www.bloomberg.com/view/articles/2018-03-01/americans-electricity-use-just-keeps-falling

Monthly Feature:

Navigant Research Leaderboard: IoT for Lighting

Assessment of Strategy and Execution for 15 Key Market Influencers

Navigant Research defines the Internet of Things (IoT) for lighting concept as adding value beyond illumination. IoT lighting solutions for commercial buildings bring connectivity to devices that were previously not connected and provide data (where data was not available) through the connection. Connectivity and communication can happen between devices within the lighting system and between lighting devices and non-lighting devices. Within lighting systems, such communication can be accomplished through lighting controls. Networked lighting controls achieve many of the aspects described in this definition of IoT lighting solutions.

Lighting controls, originally designed for dimming or daylighting, have shifted to more sophisticated controls that can provide space utilization, conference room management, increased employee productivity, and improved operational efficiency. This shift has expanded the vendor ecosystem for lighting controls in commercial buildings beyond lighting manufacturers and lighting control companies to include technology firms and startups. The evolution from an intelligent lighting system toward an IoT lighting system has occurred in large part because of the easy use of sensors as a host for IoT applications. This evolution has expanded the playing field to include many companies that do not manufacture their own luminaires but focus instead on the sensors and controls or platforms for an IoT lighting system.

This Navigant Research Leaderboard evaluates 15 vendors in the IoT lighting for commercial buildings market. These players are rated on nine criteria: vision; go-to market strategy; partners; technology; geographic reach; sales & marketing; solution performance; solution portfolio; and staying power. Using Navigant Research's proprietary Leaderboard methodology, vendors are profiled, rated, and ranked with the goal of providing an objective assessment of their relative strengths and weaknesses in the market for IoT lighting solutions in commercial buildings. https://www.navigantresearch.com/research/navigant-research-leaderboard-iot-for-lighting