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# Electrical Review

December 2018

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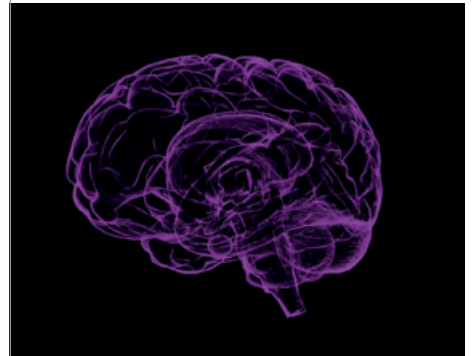
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## UK homes must be renovated

The UK cannot build its way to a low-carbon future without retrofitting the UK's old, cold homes to meet 2050 climate targets, a new report from the Institution of Engineering and Technology (IET) and Nottingham Trent University states.

Energy used in homes accounts for about 20% of UK greenhouse gas emissions and three quarters of that comes from heating and hot water. 80% of the homes people will inhabit in 2050 have already been built, meaning it is not possible to rely on new builds alone to meet legal energy-saving targets set in the 2008 Climate Change Act.

Deep retrofitting is a whole-house approach to upgrading the energy efficiency in one step as opposed to a series of incremental improvements over a long period of time. This includes: Adding solar panels and local micro

generation\*, insulation and ventilation, and sustainable heating systems.

Rick Hartwig, IET Built Environment Lead, said: "If we are to meet the 2050 targets of the Climate Change Act, then all housing in the UK must have zero carbon emissions from space and water heating, and space cooling.

"New and innovative products will always assist in reducing costs and improving energy performance, but sufficient work has already been done in research and pilot studies, to show that massively reducing the carbon emissions and energy requirements of current housing is achievable and needs to be done. Retrofitting has other benefits too, making cold homes warmer, healthier and reducing bills.

"There is considerable practical experience in financing deep retrofit projects, managing

them, and engaging with the householders. We need to build on that experience to create a national retrofit programme to deliver our 2050 goals. This will not only help drive demand but allow greater scale to cut the costs per property.

"Local Authority and Housing Association homes account for 17%, approximately 4.5million, of UK homes. It is the logical place to start scaling up demand for retrofit and driving down costs.

"A one-off deep retrofit versus 30 years of ongoing maintenance costs gives better economic outcomes and a quicker improvement in housing quality. This is not just a technological challenge; Governments - both national and local - must take the lead in encouraging and supporting the necessary changes which will in turn support clean growth."

## Luxury experience controlled with KNX building automation



ABB i-bus KNX technology is being used to maintain optimum conditions for guests at the new Santa Claus Village on the Arctic Circle in Rovaniemi

The temperature, ventilation and even the operation of glass heating in 71 glass igloos from luxurious Finnish hotelier, Santa's Hotels, are being individually controlled with ABB i-bus KNX technology.

For the hotel owner, this automation guarantees that the experience for the hotel's exacting customers is consistently of a superior standard, whilst ensuring that the energy costs remain in check.

Despite the design of the 20 m2 glass igloos appearing simple, they conceal a lot of high-performance technology. The ABB i-bus KNX system controls everything from the internal and external heating of the hi-tech glass-roofed igloos, clearing the frost from the glass to give a perfect view of the sky to air source heat pumps and underfloor heating.

## Change a life

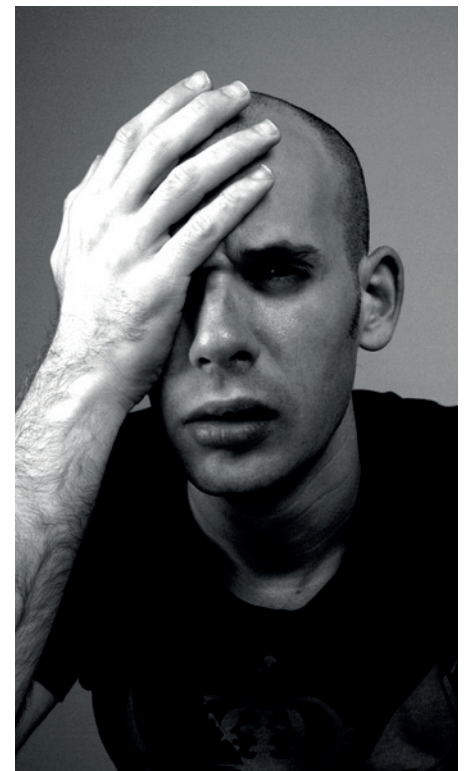
The stigma around mental health issues is one of the biggest silent killers in the electrical sector, but you have the power to change this by donating just £1 to the Electrical Industries Charity's (EIC) powerLottery.

powerLottery is EIC's number one fundraising stream which helps to save and improve the lives of those who are currently struggling from mental health problems and are in need of support to help them look forward to a brighter future.

Where mental health issues are concerned, early intervention is vital in turning someone's life around. Through the funding provided by powerLottery, EIC was able to help Anant Savani in the early stages - ensuring he is now well on the way to a better future. Since losing his job at the construction company, Anant has suffered from anxiety and depression. He struggled to open up to his family or colleagues about his feelings and as a result, started to have suicidal thoughts on a daily basis and eventually came to a point where he almost took his own life. It was at this point that he knew he needed to seek help.

A previous employer whom Anant worked for at the beginning of his career put him in touch with the Electrical Industries Charity who, thanks to supporters like you who donate £12 per year to powerLottery, were able to offer him counselling and continuous support which was needed to help him to look forward to a better future.

Mental illness knows no boundaries and can affect anyone at any time. With as little as £1 per month, you can help to change the lives of people like Anant, who are currently suffering from mental health issues in isolation. All you need to do is simply download EIC powerLottery app and tap to play with a chance of winning up to 15 cash prizes of up to £1,000 each month and £10,000 twice a year.





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## JTL chief executive responds to good news in Budget

JTL chief executive Jon Graham was pleased to hear the chancellor's announcement in the Budget a reduction in the level of contribution required from SMEs, towards the cost of apprenticeships, at a time when the numbers of apprenticeships being started in England is well down on the previous year.



The chancellor announced the contribution of employers will be reduced from the current 10% level to half of that, at 5% from April 2019. The chancellor resisted the temptation to remove the 10% contribution altogether that had been called for by some in the training sector.

"We applaud the proactive measure by the Chancellor to support apprentices and particularly the SME organisations who are the life blood of this form of training," he said.

"There is no doubt smaller businesses have been reticent about taking on learners given the additional training costs imposed - these are on top of all the employment and supervision costs already incurred. We are currently participating in some serious research with small and medium sized businesses to understand the wider reasons why there are barriers to taking on apprentices at the present time and look forward to sharing our findings shortly."

## Outage highlights difficulty of balancing power markets

The rise in mobile network outages, unpredictable weather patterns and other unforeseen events is making the challenge of balancing European power markets more difficult, energy analyst EnAppSys has warned.

When Vodafone suddenly lost its 4G mobile service in the Netherlands recently, vital real-time balancing data became unavailable. This incident coincided with an unplanned outage at one of the country's largest power plants, the Rijnmond 1 gas-fired plant – a double whammy which left the Dutch system short and caused prices to soar.

EnAppSys said these events highlight how seemingly unrelated incidents can have a big impact on energy markets.

Director Jean-Paul Harreman said: "The availability and reliability of mobile networks is crucial to energy markets. When the Vodafone network in the Netherlands failed, we noticed that the data-feed of our provider of greenhouse data went down. This is logical; if the phone network is unavailable, you can't

collect meter-data over 4G connections.

"However, it also meant that sending modulation instructions to greenhouses was not possible. As a result, when the Dutch system went short because of an outage at Rijnmond 1, the usual quick reaction from greenhouses – ramping up generation or switching off the lights to take advantage of high balancing prices – did not happen. In fact, the greenhouse sector was largely absent in the balancing market and this caused prices to surge on several occasions.

"We foresee that in the future we will see more of these types of seemingly unconnected events having a significant effect on energy markets."

Aside from mobile phone network outages, unpredictable weather patterns have also put a more extreme load on electricity grids around Europe and caused major power shortages at critical times, while TSO's (Transmission System Operator) are facing challenges in providing more information on markets.

## 2018 Young Engineers' Awards

Reanna Evans of NG Bailey has been named as the CIBSE ASHRAE Graduate of the Year 2018 and Elementa as the CIBSE Employer of the Year.

Evans was selected from a shortlist of eight finalists and Elementa came out on top after six firms reached the final stage of the CIBSE Young Engineers' Awards sponsored by Andrews Water Heaters; Kingspan Industrial Insulation, Swegon Group and the CIBSE Patrons.

The ceremony was held at the Institution

of Mechanical Engineers (IMechE) in London and also saw the presentation of the IMechE's special achievement award to Bruce Arnold and the Geoffrey Engert Award for a young technician to Lucy Austin of Atkins.

The CIBSE Young Engineers' Awards have been celebrating the industry's best examples of young engineering talent for 23 years and give recognition to those companies who champion the next generation of engineers through a commitment to education, on the job training and mentoring.



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# GOSSAGE

## Lies. Damned Lies and Statistics

The Office for National Statistics (ONS) is the official organisation charged with the collection and publication of statistics related to the economy, population and society of the UK. Its formal position is as a non-ministerial department which reports directly to the UK Parliament.

David Drew is the shadow environment minister. So in effect the ONS is reporting to him. He had obviously noted that, in its latest Low Carbon and Renewable Energy Economy Survey, that official source for statistics had concluded that, whilst there were 48,900 people working in the renewables sector, the total number of those employed in nuclear energy reprocessing and generation in the UK was now down to just 12,400. But here was the junior energy minister Richard Harrington boasting at the Nuclear Industry Association conference that 80,000 people were employed in the nuclear industry.

So Drew raised a Parliamentary Question, asking what assessment Minister Harrington had made of the accuracy of that ONS 12,400 figure for nuclear employment. After a long pause, the Minister replied. His line was that the Nuclear Skills Strategy Group, of which the Business Department is a member; had calculated that there were now 18,700 full time equivalent people employed in nuclear fuel processing and generation.

Whilst nothing like the 80,000 jobs Harrington had been citing, even this new figure is over 50% higher than the official ONS one. This was, he claimed, due to the ONS employing a "different dataset and weighting factor". To which my response would be: surely if the ONS is charged with providing all the nation's official statistics, it is their datasets and weighting factors which should be the gold standard. Not that adopted by an industrial interest. Even if the Government department is a member.

## Exploding the myths

There are so many myths around concerning trends in the UK energy market, that I thought a few facts about what is actually happening in the real world might not come amiss. Let me set out four specific highlights drawn from the Government's official figures for the three month period between June and August 2018, compared with the exact same period in 2017

1. Primary energy consumption in the UK on a fuel input basis fell by a further 1.1%. On a temperature adjusted basis consumption fell by 1.7%. This means that final energy consumption is now almost one-fifth lower than it was 15 years ago.
2. Indigenous energy production is down by 0.9%. But gas, bioenergy and solar output are all up, with falls in output from all other fuels.
3. Electricity generation from Major Power Producers is down 0.7%, with coal down 47% but gas up 7.9%. Overall though, renewables were down 5.6% despite strong solar generation.
4. Gas provided 49.1% of electricity generation by Major Power Producers, with nuclear at 27.5%, renewables at 22.2% and coal at 1.2%. Low carbon share of electricity generation by Major Power Producers down 2.8 percentage points to 49.7%. All of which shows how increasingly important independent electricity production now is.

## Europe bans UK boondoggle

A decision from the European Court of Justice has brought to a crashing halt a UK Government scheme which has already paid out £5.6bn. The money has gone almost entirely to those in business to sell electricity, ostensibly to ensure the lights stay on in winter. Even so, Business Secretary Greg Clark immediately retorted there would no danger of black-outs, even if no further payments could be made under the scheme - thus rather undermining its entire rationale.

For years those anxious to help companies reduce energy wastage have fought a hitherto losing battle with UK energy policy makers, who seem perpetually to favour those in business to encourage energy consumption. The latest example is this Capacity Market scheme, which the ECJ has outlawed precisely because the UK Government has placed far more stringent timing criteria upon those seeking to reduce demand. It is a very unlevel playing field, where maximum 12 month arrangements on the demand side are "competing" with up to 15 year contracts on the fossil fuel supply side.

Logically this ruling should ultimately force the UK government to design an energy system that reduces bills by incentivising and empowering customers to use electricity in the most cost-effective way – while maximising the use of climate-friendly renewables. One wonders to whom the Forces of Good shall be able to turn, should the hardline Brexiteers get their way and block the ECJ from having any further jurisdiction here?

## Wheel of misfortune

Just as I predicted in my October Diary, Toshiba has given up the unequal struggle to build a new nuclear power station at Moorside in Cumbria. Right next door to dear old Sellafield. It seems the company cannot even give its interest in the project away, so financially toxic is the business of building them.

That financial debacle does of course give the Department of Business another opportunity to make yet another wrong decision on nuclear power, and step in. After all, this is an industry that for decades has been operating a billion-pound version of the famous losing Monte Carlo roulette-player's telegram: "System working well. Please send more money."



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## Ventilation solution basement refurbishment project

Fan manufacturer Vent-Axia has supplied central extract units to a refurbished tenement property in Edinburgh New Town. The former basement store has been redeveloped and extended to create a luxury five-bedroom home and has been named as one of the '100 best homes in Scotland since 2000' according to the Royal Incorporation of Architects in Scotland

**T**he project, led by Capital A Architecture, involved an extensive redesign and extension that created a more open plan living area, split over two levels. The rear garden is steep and the re-designed garden room has a lowered floor level to connect to the garden with as few steps as possible. The seven-month build included installation of a continuous mechanical extract ventilation (MEV) units which provided ventilation to the kitchen, bathroom and three en-suite areas.

Niall Hedderman, director at Capital A Architecture designed the project and was involved throughout the construction phase. As a listed building, ventilation specification had to be considered carefully to minimise alterations to the building's

structure. Hedderman explained: "The Vent-Axia Multi-vent was specified since it minimised the number of penetrations on the external wall, a serious consideration for alterations to a listed building."

### ●● A continuous running MEV system ●●

A continuous running MEV system, it was suited for the project since its integral humidity sensor is designed for the simultaneous ventilation of separate areas in the home. The integral humidity

sensor increases fan speed in proportion to relative humidity levels, saving energy and reducing noise. By reducing moisture levels and removing pollutants in the air such as carbon dioxide, indoor air quality is much improved and helps to create a healthier living environment.

"The system was a good choice for this property thanks to its ability to provide effective ventilation to multiple rooms in a property; it is recognised in SAP PCDB for a kitchen and up to six wet rooms" said Jim Graham, new build residential consultant at Vent-Axia. "Add to this low noise levels of only 18.1 dB(A) @ 3m and a specific fan power as low as 0.16 W/l/s, the lowest SFP figure of any demand control MEV system, making it one of the most efficient products on the market."

Both energy efficiency and a humidity sensor were key drivers for the MEV system's specification. Boasting energy efficient EC/DC motors the Multivent helps achieve carbon footprint reduction targets since the motors lose a third less energy to heat than a conventional AC motor. Meanwhile, the integral humidity sensor, which increases fan speed in proportion to relative humidity levels, also reacts to small but rapid increases in humidity, even if the normal trigger threshold is not reached. This unique feature ensures adequate ventilation, even for the smallest wet room. And its night time relative humidity increment setback feature suppresses nuisance tripping as humidity gradually increases with falling temperature. These options are ideal in this type of property that has low levels of natural ventilation.

Multivent has been designed to meet the exacting demands of developers, installers

and users offering advanced control options and easier installation and commissioning. An integral LCD display allows the installer to select appropriate low, normal and boost speeds to meet demand as well as manual and automatic control options. It features Plug-n-Play automatic sensor detection, an

integral adjustable overrun timer and delay on timer and there is the option of wireless control with up to four controllers per system. In buildings suffering from high moisture levels at the point of installation, there is a Dry Out setting which boosts the system for one week to assist in removing moisture. **ER**



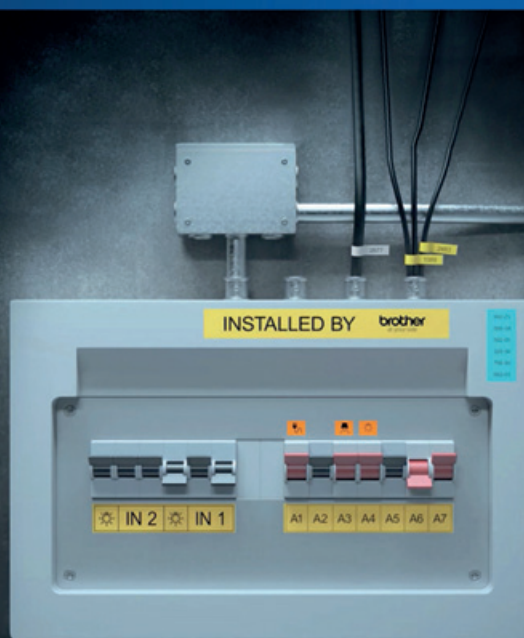
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# Making human-centric lighting usable, for a more productive workplace

Steve Stark, sales director Trade UK & Ireland, LEDVANCE, explains



**A**lthough today's LED lighting has been adopted primarily for environmental reasons, the new technology also brings unprecedented user controllability that creates opportunities to utilise lighting for extra benefits such as enhanced productivity, performance, and wellbeing in the workplace.

## HUMAN-CENTRIC LIGHTING

Traditional electric lighting has typically

allowed dimming but provided few - if any - other practicable options to adjust the light to suit users' needs. Now, with simple electronic or software control and the right combination of emitter types, an LED light engine can manage the spectral content with great precision to produce almost any colour or adjust 'white' light throughout a range of correlated colour temperatures (CCT) expressing ambiances from warm, to cool, to daylight white. At any desired dimming ratio.

Arising from this new-found flexibility, concepts such as colour quality, mood lighting, and human-centric lighting have gained traction. Each offers an approach to creating a more comfortable, compelling environment for various activities such as working, studying, driving, shopping, and socializing or relaxing with family or friends.

Let's take a look at human-centric lighting, which recognises the effects of light on the human being extend beyond mere illumination.

Humans have evolved from a time when natural light from the sun dominated the daily routine. Human circadian rhythms – the 24-hour body clock that governs natural cycles of activity and rest by managing hormone levels – are known to be heavily influenced by variations in natural light throughout the course of the day. Natural light levels are low in the early morning, with low CCT, rising to much higher levels during the day when human activity is at its peak, and then returning to low light levels and low CCT during the evening before nighttime brings conditions for sleeping: very low light levels and medium CCT.

The advent of artificial light – and electric lighting in particular – has appeared to deliver freedom from these primal constraints. It has been effective, up to a point, as new opportunities have been created to enjoy nightlife, maintain 24-hour services, increase productivity, and even offset the natural aging of human visual receptors to allow people to remain active and live independently for longer.

On the other hand, there can be negative effects. Isolation from the rich and continuously varying characteristics of natural daylight – replaced by prolonged exposure to uniform, unchanging artificial light, containing only a small subset of the natural spectral content – can cause unwanted effects such as extreme fatigue and depression.

Fortunately, the easy controllability of LED lighting now makes it possible to replicate and even idealize the characteristics of natural light, to better support human circadian rhythms. This should allow workers to be happier, healthier, and more productive. It is worth noting human-centric lighting requires higher levels of illuminance than standard LED lighting, as well as increased spectral content at blue wavelengths, to achieve the desired biological effects. Experts believe the gains in productivity will outweigh the costs of increased energy consumption.

### ENHANCING THE WORKPLACE

Although unlikely to stimulate super-human performance, human-centric lighting could certainly help workers perform at their best for longer during the day and be better prepared for the restoration of body and mind caused by the change in hormone



secretion towards the end of the day. The main advantages, therefore, are to enhance wellbeing and motivation, maximise performance and assist concentration, and promote vitality and creativity.

With everything currently known, there is clearly an opportunity to significantly improve the working environment. Of course, in the business context, results are needed to demonstrate that the investment has delivered a return. How can ordinary business owners turn scientific reasoning into deterministic practices that deliver measurable results?

## Human-centric lighting working with rest

Without convenient usability, human-centric lighting could receive scant attention from end users who do not understand how to choose from a large selection of optional settings and adjustments. The beneficial effects of human-centric lighting can be subtle, and often only appreciated by analysing long-term trends and data. Hence, if the lighting system is at first difficult to understand or use, or trying out basic

settings has little apparent effect, there is a risk that business users will dismiss the idea.

### BEATING THE USABILITY BARRIER

To overcome the potential for misunderstanding and rejection, LEDVANCE has designed its HCL Controller to automatically adjust the intensity and spectral content throughout the day in keeping with current knowledge about human responses to natural lighting.

The controller is easy to install, with automated self-configuration, and is designed to apply correct circadian timing to let users begin applying human-centric lighting without any prior knowledge. A simple rotary switch and display allows advanced users to optimize the lighting for individual needs or specific situations. Wirelessly connected luminaires such as LEDVANCE's 3600lm HCL Panel and 540lm HCL Spotlight convert the settings into optimised light that complements the effects of natural light throughout the working day.

Understanding that human-centric lighting works with the body's natural patterns of rest and activity, it makes sense the lighting itself should present an intuitive user interface and enhance – rather than dominate or replace – natural light. Technology that enshrines this logic could revolutionise our expectations for human performance. **ER**

# Top of the class

Lighting controls specialist BEG has enabled a brand-new London free school to achieve its energy efficiency ambitions and provide an enhanced learning environment for its pupils. Elinore Mackay spoke to Stephen Payne of BEG to find out more about the project on what benefits the project has already brought and what can be expected from the future



## STEPHEN, DO TELL ME HOW THE PROJECT AT THIS LONDON SCHOOL CAME TO FRUITION

John Keats Primary Free School opened to reception pupils in September 2018 and occupies the first two floors of a new residential development in South Bermondsey, London. It will eventually cater for 420 pupils up to year six.

We were selected to supply the presence and motion sensors for the school as the products offer the dual benefits of complete lighting flexibility to ensure the building is fully energy efficient, while helping to create an excellent learning environment.

The new school has high ambitions for

its pupils and, with the building designed with education in mind, the lighting had to be designed and controlled in a way that would maximise the pupils' comfort, concentration and alertness.

## HOW WERE ENERGY SAVINGS/COSTS APPROACHED?

The lighting also needed to be automated and adjustable, with different areas requiring different lighting levels and timings, and the additional need that areas were only lit when occupied, to save energy and reduce costs. To meet all these requirements, we supplied two different types of presence and motion sensors from

a range of KNX products.

The sensors selected were the PD11-KNX FLAT FC and the PD4 KNX C FC.

The PD11 sensor was selected for the classrooms and other rooms, including the headmaster's office, as it is less than 1mm thick, making it a flush and discreet option.

The classrooms have been set up to operate in semi-automatic mode (sometimes referred to as absence detection). This means the lights and the detector must be turned on with a wall switch.

The lights then set their brightness levels automatically and will continue to operate until there is enough natural day light or no occupancy present in the room. Reading ►

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the level of daylight in the room, the PD11 automatically adjusts the luminaires to the required level to make sure the lighting level is always enough and make maximum use of natural light.

For the corridor areas of the school, which run nearly the entire length of the two floors, the PD4 KNX C FC was selected. This product is specifically designed to cover long corridors so fewer devices were required to get full coverage, resulting in a reduction in time and additional cost savings for the school.

#### WHAT ADDITIONAL COMPONENTS OR EQUIPMENT FORMED PART OF THE BRIEF?

The building controls, cabling and trunking were designed and installed by Neo System Automation. The company used the lighting sensors as part of a modular I/O WAGO 750 Series building control system, along with other devices, to control not only lighting but heating, ventilation and air



conditioning (HVAC) too.

The KNX system monitors conditions to provide optimum lighting, temperature, humidity and CO2 levels in the school, all of which have been shown to improve alertness and concentration.

#### HOW HAVE THE SCHOOL'S STAFF COPED TO DATE WITH THE CHANGES?

Importantly, with use of the BEG sensors, school staff can manually override the controls and dim the lights down or off for presentations or showing films, while reducing lighting levels in areas when there is no occupancy at all. Automated controlled systems can reduce energy costs by up to 30% compared to manual control.

We were naturally delighted to work with Neo System Automation on the new free school.

The PD11 has a very sophisticated design and with a visible thickness of .85mm the device is fitted into a ceiling making it virtually invisible, so it was ideal for placement in the classrooms and offices. It is very discreet but it still capable of detecting motion and light within an area of up to 9m.

The PD4 was the most logical product for the corridors as it saved installers lots of time as fewer sensors were needed for this space thanks to the extensive coverage it offers. **ER**

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## Lighting regulation up to 16 m mounting height

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# Luceco, McCann Electrical and Ameresco partner to relight The Edinburgh College Estate

**L**uceco has recently supplied an energy saving LED lighting upgrade to several campuses at Edinburgh College including Sighthill, Milton Road, Granton, and Midlothian. As one of Scotland's largest educational establishments, the College has over 19,000 students across Edinburgh and the Lothians.

Ameresco is a leading renewable energy and energy efficiency company offering ESPC-funded energy solutions for public and private organisations. ESPC (Energy Saving Performance Contract) is a third-party financing mechanism that allows building owners to fund energy-saving upgrades through savings made from future utility bills. Ameresco chose Luceco as their preferred lighting manufacturer for Edinburgh College, and McCann Electrical Contractors based in Motherwell were chosen for the electrical installation throughout the campuses.

Many areas throughout the College

benefited from the LED lighting upgrade. The Sighthill campus is located to the West of Edinburgh and hosts state-of-the-art music and learning centres and has excellent sport facilities. The Milton Road Campus is based in the East of Edinburgh providing modern facilities, in particular training restaurants and a purpose-built auditorium, with the Midlothian Campus, based in Dalkeith, providing one of the most advanced technology teaching centres in Scotland.

The sports and health facilities at Milton Road is equipped with the latest resistance training machines and cardio equipment. Platinum LED Downlights were installed in many of these areas including open plan communal spaces such as cafeterias and foyers and specialised learning centres, offering possible running cost savings of up to 80%. Designed to retrofit ceiling cut outs of common compact fluorescent downlights, the Platinum features easy fit positive locating swing out tabs and

interchangeable bezel options and is ideal for use with sensors and lighting controls.

Edgelit and Backlit LED LuxPanel luminaires were installed into many areas including seminar rooms and lecture theatres, libraries, and classrooms as well as communal areas. Quick and easy to install with no maintenance requirements and no visible frame when installed in the ceiling grid, high efficiency LuxPanels were supplied with remote 'plug and play' drivers for ease of installation. Available in standard fixed output, dimmable and emergency options, high efficiency Backlit LuxPanels boasts a market leading efficacy of 152 Lm/cW, providing non-obtrusive but effective lighting in high traffic areas and improved glare control.

Based in the North of Edinburgh, the Granton Campus is a modern facility housing the 'Learning Street', provide students with study spaces and the most up-to-date technology available. High

efficiency LuxPanels we also used here along with the Academy luminaire. Designed for surface mounting in offices and educational environments and providing 50,000 hours of maintenance free operation, Academy is as an ideal replacement for linear fluorescent fittings.

Granton also houses one of Scotland's largest training providers in the performing arts and the Construction Centre for Excellence. A wide range of modern and traditional construction courses – from glazing, carpentry and stone masonry to conservation and heritage construction skills are all on offer. In the Workshops, the IP65 rated Climate LED luminaire was used. With a polycarbonate construction with opal diffuser and stainless-steel anti-tamper clips, Climate is available in 1200mm, 1500mm & 1800mm body sizes, specifically designed to replace fluorescent luminaires.

This weatherproof high-performance fitting can be surface or suspended via metal fixing points.

Climate Extra has a market leading efficacy of 142 Lm/cW with increased performance for improved energy efficiency. Climate luminaires were also used in carparks throughout the campuses.

The main student social area is known as the 'Hub' and is surrounded by a range of college facilities, including student services. The Corridors were lit with Edgelit LuxPanels and Atlas bulkheads. Atlas provides an alternative to traditional 28 and 38 watt 2D compact fluorescent fittings. Atlas luminaires can be fitted with an integral microwave sensor to further reduce energy consumption. With the corridor function selected, the sensor adjusts the light level to 10% of the normal level when the space is unoccupied.

Other luminaires installed included Celeste, an attractive circular LED luminaire from Luceco featuring a 'corona' backlight effect with a direct / indirect light distribution. The luminaire can be surface, wall mounted or suspended using a 3 point 1.5-meter suspension kit, creating an attractive pendant. Celeste offers up to 50,000 hours working life with no maintenance or re-lamping requirements which benefits the environment in terms of energy efficiency and lamp disposal.

To date there have been over 6000 energy saving LED luminaires installed throughout the Campuses at Edinburgh College through the partnership with Ameresco, Luceco and McCann Electrical. McCann's have an excellent track record in delivering a wide range of electrical solutions across a number of industry sectors with expertise working within educational establishments. The product selection was compiled by Grahame Scott, Project Manager at Luceco who identified the best fit energy efficient replacement luminaires on a one for one basis in each area to be relit.

Edinburgh College is committed to ensuring their students are prepared for successful careers and connections to industry. They are also committed to a more energy efficient and cost-effective future throughout their estate, LED lighting from Luceco being a contributing factor, as well as maintenance on lighting provision being substantially reduced due the elimination of re-lamping of old luminaires.

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# Intelligent power for data centres

**A**s the start of 2019 approaches, society is relying ever more on data services as the backbone for smart services. In the consumer world, online shopping, travel bookings, financial and other services need constant always-on data to fulfil the needs of people who expect services on the go. However, as the worlds of transport and industry become more driven by data, the availability and transmission of that data will become increasingly important to safety and continuity for public services and business.

In turn, data centre power has become critical to the operation of our cities and industries and therefore data centre operators set high standards for the power systems that feed the servers.

As the power feed from the mains, a data centre's grid connection needs to have high reliability, as measured by availability.

## GRID CONNECTION

At the most resilient end of the market, today's Tier 4 data centres have availability of at least 99.99 percent and the resilience to ensure continued service in spite of planned and unplanned outages. To achieve this, they often have two independent

connections to separate power transmission or distribution grids.

For example, Telehouse's Docklands campus in London has separate connections to two individual 132 kV transmission grids. This gives 'five nines' (or 99.999 percent) reliability and dual redundancy that means in the case of an interruption in power, the supply will switch seamlessly to the second feed. In addition, by tapping into the 132 kV grid, Telehouse can avoid paying DUoS (distribution use of

## ●● Securing the grid connection for a new data centre can be a significant project ●●

system) charges to the utility.

However, securing the grid connection for a new data centre can be a significant project in its own right. In the case of the Docklands substation, ABB delivered the grid connection for Telehouse. Because ABB is accredited under the National Electricity Registration Scheme, ABB was able to deliver the project on a turnkey basis, with

Distribution Network Owner (DNO) UK Power Networks providing only the 132 kV supply points.

Known as a contestable connection, this type of project enables data centre owners to reduce the lead time for new grid connections. Many of the UK's DNOs are heavily over-subscribed with applications for new connections – and in some instances they are not able to deliver the works in time to meet their customers' plans. As a result, customers can experience long lead times and risk significant project delays for new connections.

Instead of this, Ofgem allows customers to use an independent connection provider (ICP) to save time, expense and project risk by delivering the connection itself. The DNO focuses on just the non-contestable element of the project. This involves verifying the availability of a point of connection as well as checking the availability of electrical capacity in the network to supply the new connection. As an ICP, ABB is certified to provide new connections from 11 kV to 132 kV.

## SUBSTATION TECHNOLOGY

In the case of Telehouse, ABB also engineered and built a new indoor substation, featuring two identical gas-insulated switchgear

(GIS) bays and grid transformers, as well as medium-voltage switchgear.

Being in the Docklands area, physical space was at a premium, so the compact size of ABB's ELK-04 switchgear helped to minimise the footprint of the substation.

Even data centres away from city centres want to minimise the land take of their power supply substations. Every square metre that can be saved from a substation could be dedicated instead to server racks and to generating revenues.

### DRY-TYPE TRANSFORMERS

Another important development for indoor substations is the dry-type transformer. Whereas traditional transformers are filled with mineral oil to insulate and cool their windings, dry-type units feature solid dielectric materials. As a result, they are non-flammable, non-combustible and have no risk of leakage.

This combination makes them ideal for indoor substations or compact sites where there is little space for civil engineering structures and where oil-filled transformers cannot be used.

While dry-type transformers have been traditionally used at lower voltage levels, recent developments in technology mean that they are now available at up to 72 kV.

### SAVING SPACE WITH PASS M0H

Freedom Group adopted ABB's PASS (plug and switch system) M0H switchgear to achieve this at a data centre under construction in 2014. PASS switchgear is a hybrid form of switchgear that combines the competitive cost of air-insulated switchgear (AIS) with the compact size of GIS.

PASS switchgear is available in a number

of configurations, with the M0H enclosing all the functions of a complete switchgear bay with an H configuration in a single assembly. It includes circuit breaker, combined disconnect and earthing switches, current transformers and fast-acting earth switch.

In practice the H configuration means that a single switchgear unit can control the flow of power from two grid connections to two loads along parallel circuits or across an interconnection between the two lines that is controlled with a changeover switch. The result is flexibility and security of supply between the two incoming or outgoing circuits.

This is the case for Freedom Group's installation, which is connected to two separate incoming feeds from UK Power Networks' 132 kV grid.

### DIGITALLY ENABLED POWER TRANSFORMERS

Another important aspect of operations is remote monitoring and data analytics of power transformers in real time. This will enhance the reliability and availability of grid connections.

For several years, it's been possible to retrofit sensors and diagnostic systems to existing transformers. For example, ABB's CoreTec monitoring systems measure key operating parameters to help identify any issues before faults can arise. It monitors temperatures, currents and the quality of the insulating oil inside the transformer.

In addition, a CoreTec unit will act as the communication hub for a transformer, with a local interface for operators on site, as well as a web connection for remote condition monitoring.

However, the latest development in

2018 is that ABB is now integrating digital technology into new power transformers. For data centre operators, this means that they will benefit from 'digital native' infrastructure and will be able to optimise the operation and maintenance of assets from cradle to grave.

### MICROGRIDS FOR RESILIENCE AND GREEN ENERGY

Meanwhile, as governments strive to control the impact of climate change, they are setting ever-more challenging targets on large consumers of power.

At the same time, we are seeing a profound change in the grid away from the traditional model of large-scale centralised generation and transmission and towards decentralised and renewable energies. This has led to a reduction in spinning reserve – with potential to impact power quality for data centre operators.

One approach that can help data centres react to the changing political and legislative environment is to adopt a microgrid. Not only will this ensure resilience but it will also help to make the most of green energy.

Microgrids integrate multiple generation sources, such as solar, wind, biomass, small hydro, geothermal, waste-to-energy and combined heat and power (CHP), as well as energy storage and a traditional grid connection.

A digital control system will provide dynamic control across all the various energy sources and can disconnect the facility from the power grid in the case of a fault to operate in 'island mode'. ABB has already delivered more than 30 microgrid solutions around the world. **ER**



# Rittal Offers Opportunity to Test Drive the Perforex Solution

Rittal is offering UK customers the chance to 'test drive' its Perforex machining and automation systems before they buy.

**R**ittal Perforex machining centres are a major advance for switchgear manufacturing. They are designed to automate the creation of bore holes, cut-outs and threads in mounting plates, enclosure doors and side panels. It means that the time-consuming and mechanical processing steps required for the preparation of enclosure panels can now be accomplished in a single work step to an extremely high degree of accuracy. The work can be simply programmed into the Perforex to be repeated multiple times for fast, effective batch processing.

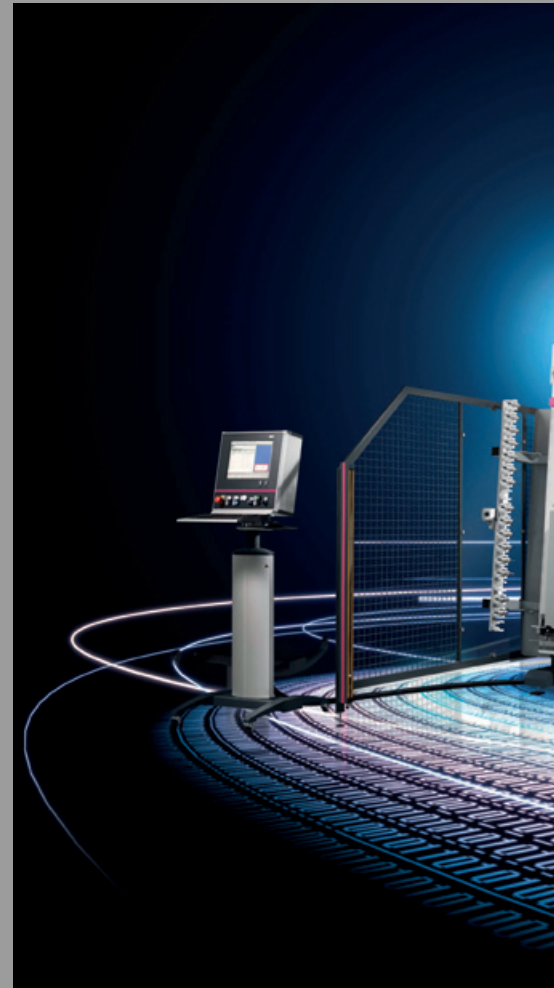
Customers are being invited to Rittal's new Working Demonstration Centre in Rotherham to see a working demonstration model of the Perforex. They can bring examples of their own enclosure modification projects using Rittal

AE enclosures and compare the quality of finish they're currently achieving, as well as the time a job takes, with that delivered by the Perforex.

"The Perforex really is a game-changer for panel builders," says Paresh Kansara, Rittal's Product Manager for Industrial and Outdoor Enclosures. "Automation of mundane and routine tasks improves accuracy and quality, as well as increasing productivity and customer satisfaction.

"We've heard of projects that would have taken up four hours, now completed in 20 minutes to a consistently high standard of finish, whether the order was for one panel, or 100. And because it's cleaner and there's less waste, it can also transform the working environment.

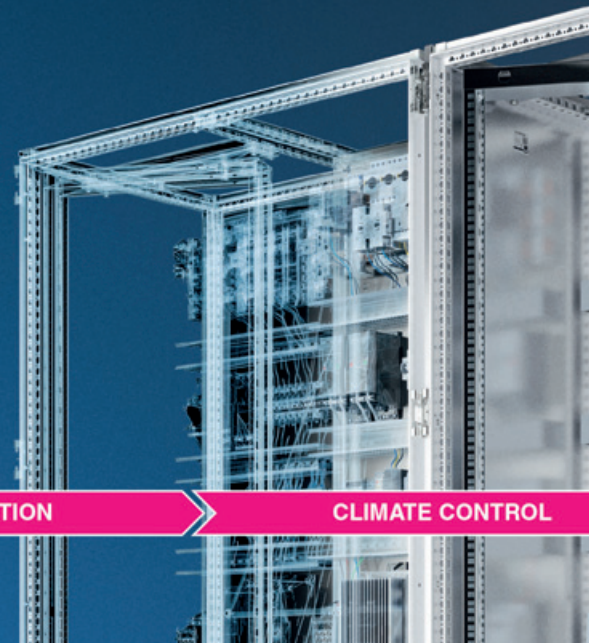
"This is the first time we've been able to offer a no-obligation opportunity for customers to see it in action and 'test drive'



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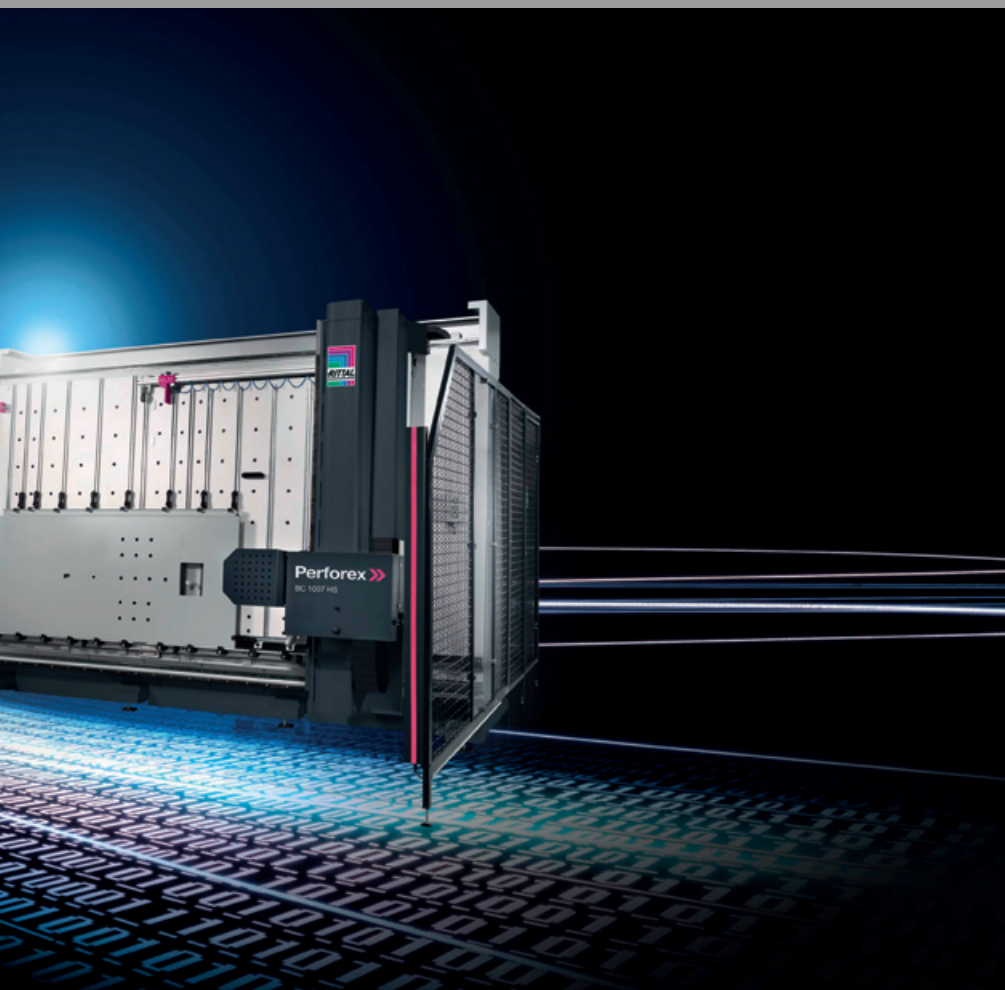
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it in the UK. We're looking forward to demonstrating it to them."

Rittal's Working Demonstration Centre also includes a RiMatrix Rig – Rittal's integrated modular solution for IT infrastructures – and a working IT chiller, which demonstrates Rittal's ongoing commitment in preparation for IoT demands and delivering edge computing solutions.

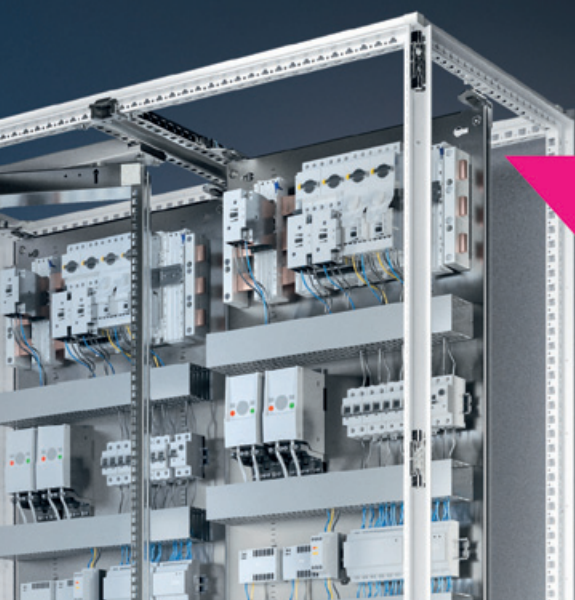
The Perforex is one of a range of automated tools, developed by Rittal, to support panel building and switchgear manufacturing.


They include tools to help with:

- handling and ergonomics in the assembly of mounting plates and panels
- cutting centres for effortlessly cutting cable ducts, cable duct covers and support rails
- automated wiring to automatically wire enclosure mounting plates, which is a huge time-saving advance – potentially saving 15 working hours per enclosure

To book a Perforex Free Trial customers should contact their Local Rittal Area Sales Manager, or email [information@rittal.co.uk](mailto:information@rittal.co.uk).

Further information at [www.rittal.co.uk](http://www.rittal.co.uk) and [www.friedhelm-loh-group.com](http://www.friedhelm-loh-group.com) or on twitter @rittal\_ltd.



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# Case for regulation

At present, anyone can claim to be an electrician and work on an electrical installation. SELECT, the trade association which represents electrotechnical businesses, and the Scottish Joint Industry Board (SJIB), which includes representation from Unite the Union, are all asking for the introduction of 'protection of title' for the profession of electrician. That is to say, we all wish to see the creation of an offence where an individual calls themselves an electrician when they have no or inadequate qualifications. It is important to underline that we are seeking the regulation of individual electricians – not companies.

## WHO ARE SELECT, THE SJIB AND UNITE THE UNION?

SELECT is the trade association for the electrical contracting industry in Scotland. Founded in 1900 as The Electrical Contractors Association of Scotland, it is the oldest electrical trade association in the world. Throughout the last 118 years, it has had two main objectives:

1. To protect public safety by driving up industry standards, and
2. To provide for the future by training apprentices for a career in the industry.

SELECT has over 1,250 member companies ranging in size from the very largest down to one-person businesses.

Taken together, SELECT members contribute a combined annual turnover to the Scottish economy in excess of £1bn and employ more than 15,000 electricians.

The SJIB was founded in 1969 by SELECT and Unite the Union. The principal objects of the Board are to regulate relations between employers and employees engaged in the industry in Scotland, to provide benefits for persons engaged in the industry in Scotland, to stimulate and further the progress of the industry, and in addition and in the public interest, to regulate and control employment, the level

of skill and proficiency, health and safety competence, wages and welfare benefits.

## WHAT IS THE PURPOSE OF THE SJIB AND SELECT'S REQUEST?

We wish to see improved safety for domestic and commercial consumers by reducing the risk of injuries and fatalities from faulty electrical installation and maintenance work.

## WHAT IS THE SAFETY PROBLEM?

All over Scotland, SELECT and SJIB members find faults every day of the week with installations that they attend in consumers' homes and in business premises. These can lead to injury or death, with 69% of fires in the UK attributed to electrical faults. Some faults lie hidden for years waiting for a combination of circumstances for a flashpoint to occur. A properly trained and qualified workforce will help towards eliminating these unnecessary risks.

## HOW BIG IS THE PROBLEM?

In Scotland, 16% of electricians working in the domestic sector are underqualified, a figure supported by the Annual Population Survey and SELECT surveys. With lower incomes in this part of the industry, this implies that some £260m of work is being conducted by underqualified electricians.

To give further context, SELECT undertook a study to identify persons who were advertising themselves as 'electricians' in various mediums, who were based in the Midlothian local authority area. From this list we identified 141 'electricians'.

From this list, 30 were identified as SELECT members, 22 were registered with the National Inspection Council for Electrical Installation (NICEIC) and five were joint SELECT and NICEIC members, a total of 57 out of 141.

Of the remaining 84, some 22 were registered with the SJIB, which left a total of 62 who had no connection to either SELECT, NICEIC or the JIB. This suggests to us that 44% of the total number of electricians identified in Midlothian could potentially be unqualified or not competent.

Midlothian has a population of 88,000, which suggests there are 0.70 unqualified electricians per 1,000 head of population. If this is extrapolated across the whole of Scotland (population 5.39 million) it suggests there could be nearly 4,000 unqualified or non-competent 'electricians' working in Scotland.

## ARE THERE OTHER ISSUES?

Yes. Both the SJIB and SELECT believe that domestic and commercial consumers should ►

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obtain value for money when commissioning electrical installation or maintenance work. We want to see a level playing field. At the present time, partially or un-qualified 'electricians' are undermining individuals and companies who invest in apprentice and staff training and innovation.

These unqualified electricians make no contribution to developing Scotland's young people by training apprentices. They don't improve their own skills and nor do they contribute significantly to Scotland's economy, as most operate in the black or grey economy.

It is worth noting the 18th edition of BS:7671 (The Wiring Regulations) is due to come into force on 1 January 2019. These new regulations introduce a number of changes and safety critical issues which the un- or part-qualified electrician will know nothing about.

### WOULD REGULATION LEAD TO A POSITIVE SAFETY OUTCOME?

Research carried out on behalf of SELECT, The Economic Impact of Regulating Electricians in Scotland (2018), by 4-consulting showed faulty electrical installations account for 7.1% of all fires in Scotland, and damage caused to property by these fires costs c. £9.6m.

A number of deaths and injuries are caused by such fires or electric shocks every year. The Health and Safety Executive estimates the financial cost to society of deaths and injuries – including to the health service, employers and the individuals themselves – and from this we can make a mid-range estimate of £6m of cost from this source.

### FAULTS LIE HIDDEN WAITING FOR A FLASHPOINT TO OCCUR

Much of the cost of faulty electrical installation lies in malfunctioning or poorly-finished work that needs to be replaced. A number of surveys point to the proportion of domestic work that is substandard. Based on these and the data on underqualified electricians, we cautiously estimate £104m of cost to the consumer from faulty electrics installed by unqualified tradesmen – about 5% of work in all. Not including the occasional major cost of catastrophic incidents, the overall cost of faulty electrical work in Scotland is c. £120m every year.

Did you know that anyone can claim to be an electrician? Would you like to take the chance that someone turning up at your home to undertake electrical work could be unqualified and incompetent?

### ARE OTHER PROFESSIONS REGULATED?

Yes. There is a notable contrast between regulation in the gas industry and its absence in the electrotechnical industry. Across the UK, there are 102 Regulated Professions including some of a surprising nature, namely Bouncers (Door Supervisors), Road/ Street Works Operatives, Arts Therapists and Public Space Surveillance Operatives.

### CAN THE SCOTTISH PARLIAMENT TAKE ACTION?

Yes. SELECT consulted Counsel to find out whether the Scottish Parliament is competent to legislate in this area. A broad summary was that there is no bar to regulating electricians under the Scotland Act 1998.

Regulation of electricians is not reserved to Westminster. Some professions including that of architect are specifically reserved but not electricians, and this has now been accepted as fact by Scottish civil servants.

### WHAT ARE THE COSTS AND CHALLENGES OF REGULATION?

Against the benefits of regulation, we must set the costs of establishing and operating a comprehensive system of qualification. We estimate that the cost of training electricians to meet the required standards would be approx. £1,000 in total. Assuming 10,000 unqualified or underqualified electricians undertook this training programme over a five-year period; this implies an annual cost of £2m.

In addition, whichever organisation ran the accreditation scheme would need to extend the administration costs of this to the whole sector. For example, the SJIB could be expanded to cover the NICEIC, NAPIT and other relevant bodies. As an indicator of cost, currently SJIB charges £16 per year for registration, and extending this cost to unqualified electricians adds a further £160,000 of cost. As we have mentioned, the literature review and data on qualifications in the industry suggest an

association between higher qualifications and higher pay (and therefore costs).

This can be read in two ways. Either it represents a cost to society in the sense that regulated tradesmen charge more to cover the cost of their training and those unable or unwilling to gain qualifications are excluded from the market – in other words the new system acts as a 'barrier to entry' that drives up costs.

Alternatively, higher wages imply higher productivity, quality of work and the fact that practitioners take a share of the benefits of the savings to be had from better safety in the form of higher wages.

Netting off costs against benefits, a cautious estimate of net benefits to Scotland from proper regulation of electricians is c. £58m. This monetary figure includes all of the benefits from higher electrical standards, such as fewer injuries and deaths, better functioning installations and improved customer satisfaction. **ER**

### WHERE CAN I FIND OUT MORE?

In December 2016 SELECT published a report entitled Electrician as a Profession – The Case for Regulation. Here is a link to the report: [www.select.org.uk/wp-content/uploads/2016/12/Report-Electrician-As-A-Profession.pdf](http://www.select.org.uk/wp-content/uploads/2016/12/Report-Electrician-As-A-Profession.pdf)

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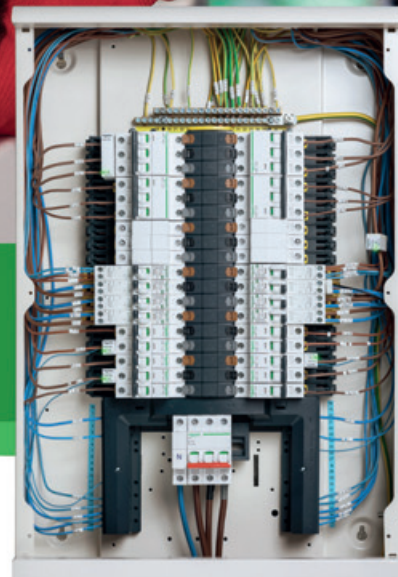
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# Ready for a year of change

Throughout 2018 Hager has been busy working with professional electricians to provide the answers to questions on all things 18th Edition. Marketing Manager, Ian Smith, outlines the five key topic areas identified by the electrical community as the countdown to 1 January 1 gathers pace

**T**he electrical industry is about to face a new regulatory landscape come January 1st 2019. The 18th Edition of the IET Wiring Regulations becomes mandatory from that date and will see the culmination of over 12 months of work and preparation to ensure manufacturers and electrical contractors remain fully compliant.

Hager has been at the forefront of efforts to ensure the electrical industry has easy access to the guidance and information it requires ahead of the 18th Edition. Their proactive approach has given all stakeholders a clear understanding on the safety-driven technical changes and new responsibilities that will come into force in 2019.

At the heart of Hager's support has been its industry-leading chatbot 'Reg'. Over the last few months, Reg has been busy answering lots of questions and queries from the UK's electrical contractors looking for guidance on important areas such as product specification and installation methods.

These have focussed on Arc Fault Detection Devices (AFDDs), Residual Current Devices (RCDs), as well as all things surge protection.

In particular, the top five most popular questions posed to Reg centred around: an explanation about AFDDs, changes to RCDs, where AFDD solutions are required, what type of RCD should be used, as well as enquiries about surge protection.

## 1. WHAT IS AN AFDD?

AFDDs are used to help protect electrical circuits in a way that will reduce the risk of it being the source of an electrical fire. An AFDD offers additional protection to measures already in place as they are designed to detect low level hazardous arcing which other devices such as circuit breakers, fuses and RCDs are not designed to detect.

## 2. WHAT ARE THE CHANGES FOR RCDs

The regulations covering residual current devices technology selection have been completely revised. There is now a requirement for specifiers to select the appropriate RCD from the range of four types available. RCDs can prevent fatal electric shocks and is a generic term that covers a range of products including RCCB, RCBO, SRCD, FCURCD, CBR and MRCD. They offer a level of personal protection that ordinary fuses and circuit-breakers cannot provide. The changes specify that the designer has to now take into account the type of equipment which may be connected to the protected circuit and specify the appropriate device.

Tell me about the changes to the wiring regulations

Sure, let me help...



### 3. WHERE ARE AFDDs USED?

The new regulations state that arc fault detection devices are recommended as a means of providing additional protection against fire caused by arc faults in AC final circuits.

An AFDD should be placed at the origin of the circuit to be protected and examples could include: premises with sleeping accommodation, locations with a risk of fire due to stored materials such as wood-working shops and stores of combustible materials, wooden buildings and locations containing irreplaceable goods.

The AFDD adds an additional level of protection for electrical circuits and further improves the safety standards for domestic and commercial electrical installations.

### 4. WHAT ARE THE DIFFERENT RCD TYPES?

**Type AC RCD** - Type AC RCD is able to detect and respond to AC sinusoidal residual current only.

**Type A RCD** - A type A RCD is able to detect alternating sinusoidal residual current and residual pulsating direct current suddenly applied or smoothly increasing.

**Type F RCD** - A type F RCD is able to detect and respond to high frequency residual current as well as pulsating DC residual current.

**Type B RCD** - A type B RCD is able to detect and respond to all types of residual current including smooth DC residual current

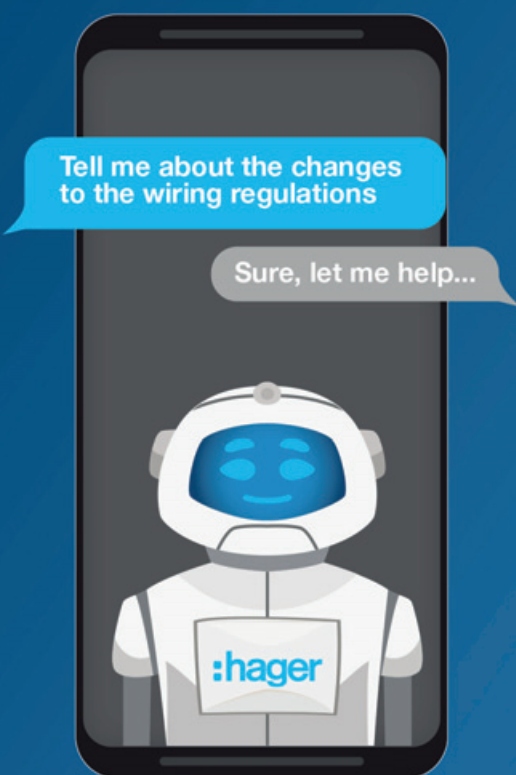
### 5. WHAT ARE THE CHANGES TO SURGE PROTECTION?

Transient excessive voltage levels in a building which occur over a short time period can be disruptive and dangerous. The 18th Edition simplifies previously issued guidance so that electrical professionals are clear about what they need to consider for the installation of surge protection devices.

The regulations now state that protection against transient overvoltages should be provided where the consequence of an overvoltage results in serious injury or loss of human life, results in the interruption of public services or damage to cultural heritage, or results in the interruption of commercial or industrial activity that affects a large number of co-located individuals.

It is now mandatory that the electrical designer considers and carries out risk assessments. To remove any doubt, the 18th Edition recommends where the result of overvoltage could result in any of the scenarios outlined above then overvoltage protection should be provided.

2019 is set to be a year of transition and change for professional electrical contractors as they fully get to grips with the new rules and regulations. Hager is fully committed to helping the industry adjust to the new landscape by offering not just compliant product solutions, but also expert advice and support via a number of channels including our accessible and informative chatbot. [www.hager.co.uk](http://www.hager.co.uk)



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# Don't automatically reset a circuit breaker that trips!

The circuit breaker just tripped. Production is down, alarms are sounding in the background. Panic time. Our guest contributor this issue, Jim Phillips, investigates

**F**or many, this scenario would mean quickly re-set the circuit breaker and 'see what happens.' Not the best idea – the question needs to be asked – why did the circuit breaker trip? This situation can become an even larger problem if the circuit breaker has setting adjustments. Before I go any further, let's back up a few steps.

## ADJUSTABLE CIRCUIT BREAKERS

Many circuit breakers have setting adjustments that can be used to define how the device responds to short circuit currents. Adjustable circuit breakers as a minimum, will have an adjustable instantaneous setting that defines the level of current where it will trip with no intentional time delay. a.k.a. instantaneous trip. If the abnormal current exceeds this current level, the device trips instantaneously – if the current is less than this level, it will trip in the time delay or overload region.

## ●● Digital breakers can have a multitude of settings ●●

Other more complex devices such as electronic trip and digital breakers can have a multitude of settings that are used to define an elaborate tripping characteristic. The preferred method for determining the settings for these devices is to perform a coordination study. This requires that the various protective device in the electric power system be analysed to determine how they should be set so only the device furthest downstream nearest the load trips in the event of an abnormal current. This allows the other devices towards the source to remain closed and results in the minimum amount of an outage.

However, there is another objective and



that is to ensure that the protective device also responds quickly enough to provide suitable protection of the conductors, transformers, motors and other electrical equipment. The recommended settings should take into account both selective coordination and protection.

## CHANGING THE SETTING

As mentioned, when a protective device

trips, often the first response is to simply reset it and see what happens. More often than not, if a breaker tripped once, it will probably trip again because simply resetting it did not solve the root cause of the problem. The second time the device trips, many 'experienced' people will increase the setting thinking that it tripped because the setting was too low and not considering why it tripped. Changing a device setting ►

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Increasing a protective device setting can create a potentially larger and more dangerous problem – increasing the arc flash hazard! Depending on the arcing

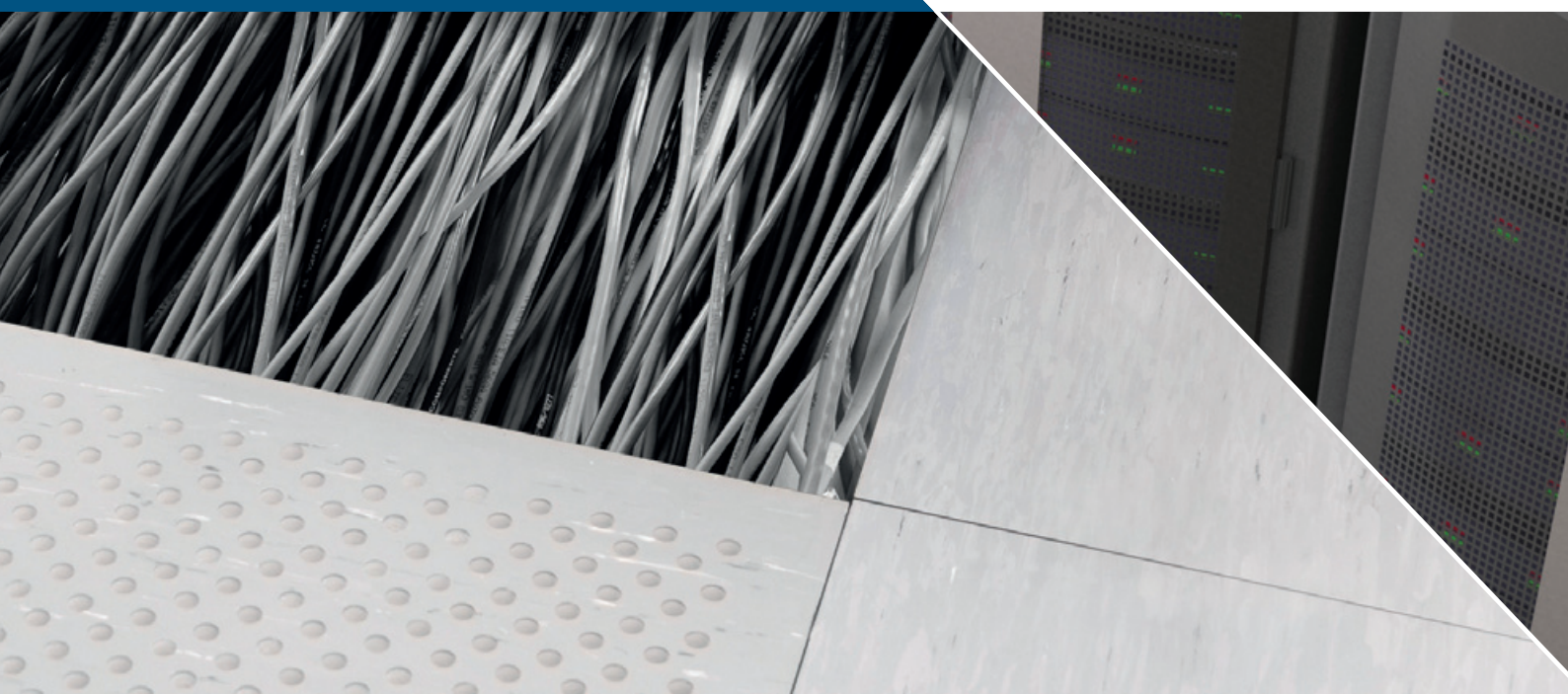


If you ultimately make a setting change, review its impact not only on the protection and coordination but also on the calculated incident energy because the next time it trips, there could be a very large BOOM! 



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# Work safer on medium voltage systems

When you work on medium voltage switchgear, your first and overriding priority will always be to maximise safety. But what can you do to protect yourself against hidden hazards that are not readily apparent? Elinore Mackay spoke with Damon Mount of Megger to look into this issue and what he would suggest looking forwards

If you're professionally involved with MV switchgear, you'll know that there are many ways in which it can fail. You'll also know that the most common is insulation breakdown, and that the results can be catastrophic. Even a modest fault in an MV installation releases enough energy to wreck equipment and, if the circumstances are truly unfortunate, to kill. Which means that, when you're working with or even near MV equipment you want to be as sure as you possibly can be that such a fault is not likely to occur.

Unfortunately, equipment that's about to fail rarely gives you an advance warning. Or does it? In fact, insulation breakdowns are very often preceded by partial discharge (PD) events. If you can detect and monitor these events, you will, therefore, have a strong indication of equipment and

cables that may soon fail. You can then investigate further and, if necessary, take the equipment out of service before a really serious problem develops.

At the very least, you'll know that it's a good idea to keep your distance from the suspect equipment if you want to stay safe. That's reason enough for owners and operators of MV systems to insist that PD checks are ALWAYS carried out on their equipment before any work takes place on or near it.

That's all very well, but how do you carry out these surveys? Equipment to detect PD is nothing new but, for the most part, it has been designed not only to detect PD but also to investigate and characterise it. That's excellent in its place, but the consequence of all this functionality is that the equipment requires skill to operate and to correctly

interpret the results. Also, if you invest in this equipment, it will undoubtedly serve you well in demanding applications, but if you only intend to use it for MV switchgear surveys, you'll be paying for a lot of features you'll never use.

What you really need is a compact instrument – ideally handheld – that is very easy to use and that provides clear, unambiguous go/no-go results. You'll need an instrument that works in a live environment, so that you don't need to take equipment out of service to carry out your surveys. You won't, however, need sophisticated functionality – you can always bring in other equipment when you want to investigate potential problems more fully – but you will need versatility, so that you can deploy the widest possible range of PD detection techniques. A PD detector can offer the versatility you need

by employing multiple sensors – both internal and external – so let's take a look at some of the possibilities.

You will find an internal acoustic sensor – essentially a microphone that listens for the characteristic noise produced by partial discharges – is a good choice for PD testing on air-insulated MV switchgear and equipment that's in direct line of sight. If you need more flexibility in where you can place the sensor, you can achieve this by using an external acoustic sensor that connects to the detector via a cable.

For fully enclosed switchgear, you'll want a contact probe that is sensitive to vibrations produced by partial discharge, while for switchgear where the components are not visually accessible – mostly vacuum and GIS equipment – an internal TEV (transient earth voltage) sensor will pick up RF radiation from the PD via the switchgear's metallic enclosure. An external TEV sensor performs a similar function but will also help you to localise the PD source.

If you have a PD detector that allows you to connect an HFCT (high-frequency current transformer) sensor, this will usefully extend its functionality to include simple on-line PD surveying of MV cables. Finally, a parabolic acoustic sensor will let you carry out outdoor surveys to detect, for example, corona and surface discharge in terminations, CTs, PTs and isolators.

Let's remember now that if you're going to be routinely carrying out quick pre-work safety surveys, your PD detector must be fast and easy to use, so what should you need to do to configure it appropriately

for the type of sensor in use? The answer is nothing! The detector should automatically set itself up for the type of internal sensor you select, or for the type of external sensor you plug in. This not only saves you time and trouble, but also makes it near impossible for you to make mistakes that might produce misleading results.

And what about those results? You may have heard – or even know from your own experience – that PD results can sometimes require skill and experience to interpret. But you don't need that level of detail for a safety survey. So how about an instrument that provides you with "traffic

## ●● Hopefully by now you are convinced of the benefits ●●

light" results? Green for all is OK, amber for caution – consider investigating further, and red for danger – further investigation definitely needed.

Of course, as you gain experience, you may well want to be able to alter the thresholds for amber and red indications to suit your own specific requirements, and you'll almost definitely want a little more detail in the results so you can record and trend them. A phase-pattern PD display option will also be useful, as it provides a very useful way to distinguish between true partial discharge effects and random noise.

Hopefully by now you're convinced of the

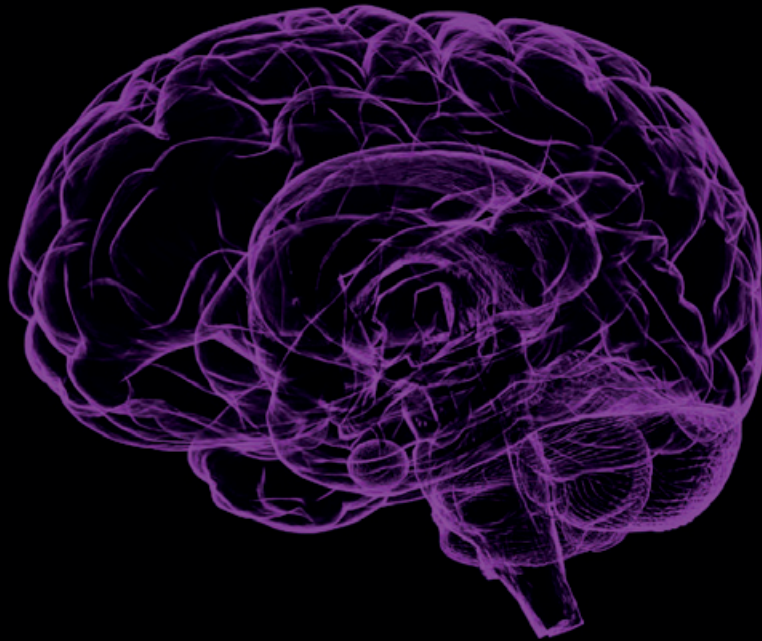
benefits of routinely carrying out PD surveys on MV equipment, especially before you start work on or near it, and so you'll be interested to know that a PD survey instrument that meets all of the requirements we've discussed has recently been introduced to the market. This is the new PD Scan from Megger.

In fact, this innovative device does rather more. It includes, for example, a camera that allows photographs to be easily attached to test reports, and which can also be used to read QR codes to identify equipment and documentation. It has a humidity and temperature sensor so that you can easily add these key parameters to your data, and there's provision for you to download your results easily into a PC and quickly generate comprehensive reports.

For all of its versatility and functionality, this instrument is as simple to use as a smartphone. It has just three buttons, and a large colour touchscreen that is intuitive in use and shows only those options you need to deal with the current operation, rather than forcing you to plough through a rat's nest of complicated menus.

Every one of us in the electrical sector is constantly aware of the need for safe working, which is why many safety precautions are "baked" into our routines: locking out circuits under test, for example, and grounding equipment that's being worked on. Now the easy-to-use equipment discussed in this article provides us with the opportunity to adopt another safety routine: that of carrying out PD surveys before working on MV equipment. The process is fast, easy and non-disruptive; the results can save not just money, but lives. **ER**





## Racking your brains

**When designing a data centre, much like building a house, laying strong foundations can mean the difference between success and (usually costly) frustration. This article takes a look at what to consider in order to avoid that dreaded downtime.**

**C**hoosing and configuring the right equipment to suit your needs can be a headache, but it's also integral to the reliability and efficiency of your facility. Racks organise your IT equipment to ensure the most efficient use of space and resources. With the right choice and configuration, they can also help drastically improve cooling, power protection, security, cable management, ease of installation and mobility.

### WHAT TYPE OF RACK?

Primarily, racks come in three types: open frame, enclosures and wall-mount, each with their own advantages.

#### OPEN FRAME RACKS

Open frames with mounting rails, but lacking sides or doors, these are typically used where the rack does not need to control airflow or provide physical security at rack level.

- Good for the management of cable dense applications due to their convenient access and open space.

#### RACK ENCLOSURES

Featuring removable front and rear doors, removable side panels and four adjustable vertical mounting rails (posts), these are also known as rack cabinets.

- Ventilated front and rear doors encourage sufficient airflow.
- Ideal for applications that require hot, heavy or high wattage equipment.
- Lockable side panels and doors means heightened physical security at rack level.
- A popular choice for high-density data centres and server rooms.
- Enclosures can be configured with or without doors for added flexibility.
- Additional rails are often included for the mounting of various accessories i.e. PDUs and vertical cable managers.
- Although not as spacious as open frame racks, wider/deeper cabinets can be obtained where extra room is required.

#### WALL-MOUNT RACKS

Exactly what it says on the tin, wall-mount racks are of course

designed to be attached to a wall. Apart from their ability to save on floor space and fit in areas where other racks can't, adaptability is the wall-mount's main plus point.

- The addition of rolling casters means these cabinets can be adapted for floor-standing applications.
- As a result of being smaller than their floor-standing counterparts, they can't hold as much weight.

#### SIZE MATTERS

Choosing a rack with enough internal space to house your equipment is key, whilst externally, ensuring your cabinets fit into the allocated floor space.

When we talk about sizing, height is the more important variable here as it will dictate the number of rack spaces available to house your equipment. To make life easier, the number of rack spaces are actually expressed in the rack's height. Typical heights for floor-standing racks are 42U, 45U and 48U, with bespoke sizes up to 58U available for some high-density data centre applications.

When it comes to width, this is generally standardised so no need to worry too much about that. However, you do need to consider the external width of your rack. The standard width for rack enclosures is 24 inches (600 mm), corresponding to the standard for removable floor tiles in a raised-floor data centre. Extra-wide 30-inch (750 mm) rack enclosures are also available, with or without extra depth.

Speaking of depth, you will of course ensure your racks are deep enough to house everything you need to house, but don't forget any cabling that will extend beyond the cabinet. The standard depth for a rack enclosure is around 42 inches (1,067 mm), but extra-deep 48-inch (1,219 mm) rack enclosures for deeper servers and blade chassis are also available, as well as shallower racks to save space. Extra depth simply ensures that cabling and various other accessories don't compromise airflow or serviceability.

#### A WEIGHTY ISSUE

The load rating (AKA weight capacity) of the rack is how much weight it can safely support. And don't forget that the floor of your facility also needs to be able to support the weight of the rack, in addition to any equipment installed inside.

Racks usually list two different load ratings: a stationary or static load rating for when the rack is installed in place and a rolling or dynamic load rating for when the rack is rolled from place to place on its casters.

Ensure that the weightiest equipment such as UPS systems and external battery packs are located in the lower regions of the rack. This stops the rack from becoming top-heavy and tip-prone – always a good idea if you plan to install equipment prior to rolling the rack to another location.

#### ROOM FOR IMPROVEMENT?

Almost as important as the racks themselves is the room in which they are located. Not only do you need enough space for the racks you currently have, but you must remember to allow space for your racks of the future, as well as asking yourself:

- Can my racks be transported from point of delivery to final location with ease?
- Are the doors of my facility tall enough?
- Do the room's circuits provide the right voltages and amperage for all my equipment?
- Is there a way for cables to enter and exit the room?
- Is the room away from heat sources? This includes inside and outside the building.
- Does the room have a way to expel the heat generated by my equipment?
- For higher wattage applications, might CRACs (computer room air conditioners) be beneficial?

## ●● Racks organise your IT equipment to ensure the most efficient use of space and resources ●●

#### LAY OF THE LAND

You will need to know where your racks are going in relation to the room (and each other), so it's wise to create a detailed blueprint for this. Placing racks in a hot/cold aisle formation will ensure more effective cooling. Do this by positioning racks in rows with hot aisles (where the racks are back-to-back) and cold aisles (where the racks are front-to-front) to help stop hot air from recirculating and contaminating your cold air supply. Arranging racks in this format can also reduce energy use by as much as 20%.



#### KEEPING YOUR COOL

It's no secret how damaging heat can be to IT equipment, overheating not only reduces performance but can also kill your equipment completely. So how exactly can a rack help keep your equipment cool? ►

### BASIC AIRFLOW

The ventilated front and rear doors on floor standing racks provide the most control over this, and if security at rack level isn't a top priority, you can forsake the doors altogether. Plenty of add-on features are also available to help prevent hot air recirculating and mixing with your cold air supply.

### AIRFLOW MANAGEMENT

Relatively cheap and quick to install, 1U blanking panels push cold air through equipment and prevent hot air from recirculating. The snap-in variety will also save you a lot of time when compared with their screw in counterparts and they fit a lot more evenly too. Brush strips, gaskets and grommets are also worth the investment, to block air leaks around cable channels or any other gaps.

●● Arranging racks in a hot/cold aisle formation can reduce energy use by as much as 20% ●●

### SIDE PANELS

Whereas ventilated front and rear doors are great for ventilation, this is not the case for side panels. Ventilated side panels allow hot air to recirculate and can cause cooling problems, so ensure that these are solid.

### CABLE MANAGEMENT

Cable spaghetti, every IT professional's nightmare. Not only does it look unsightly, but it blocks airflow whilst trapping hot air, the

exact opposite of what you want. Horizontal and vertical cable managers are your friend and will help mitigate the risk posed by messy cabling. It may also be beneficial to go for that extra width or depth when initially choosing the size of your rack.

### THERMAL DUCTS

Pushing cool air in and hot air out, overhead thermal ducts guide hot air exhaust directly to the HVAC/CRAC return air duct, creating a highly effective air flow path. With this method, hot air is isolated and unable to recirculate and mix with the cold air.

### ACTIVE HEAT REMOVAL

This method is suitable for any enclosure, and simply requires the addition of ventilation fans. Add these to the roof of your enclosure to assist with passive heat removal.

### CLOSE-COUPLED COOLING

Improve the efficiency of your existing cooling system by moderating hot spots without affecting the temperature settings of the entire room. Self-contained close-coupled cooling systems can usually be installed without outside assistance and provide the precise air conditioning needed by complex IT equipment. More effective than your traditional raised floor system, flexibility is also an advantage here, as the modularity of the system allows for quick reconfiguration should a rack be overheating, or new equipment need installing.

### CONCLUSION

So, once you've decided on your type of rack, sussed the size, location and cooling strategy, what now? Well to be honest, you're almost all set. Apart from adding extra accessories such as PDU's, once you've powered up, your next step is to monitor and maintain what you've built, but that's another article for another day. **ER**



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Warren Buffett

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# It takes two

**Paul Reeve, director of business, ECA discusses the next steps for batteries and why a winning combination of renewables and energy storage is the key to helping the UK transition to a low carbon economy, as well as opening up new opportunities for designers and installers.**

It was reported this week that the UK's renewable energy capacity overtook that of fossil fuels between July and September 2018 - the first time this has ever happened.

There are growing opportunities for contractors and service providers as renewable energy, battery storage and electric vehicles become the key components of a smarter, lower carbon UK grid.

**Renewables and energy storage together offer a winning combination, allowing customers full flexibility to use and export 'carbon free' electrical energy**

## A STRONG CASE

Increasingly, UK renewable energy delivers the cheapest, lowest carbon electrical energy available to the grid. By itself that would be impressive, but renewables and energy storage together offer a winning combination, allowing customers full flexibility to use and export 'carbon free' electrical energy.

In addition to lower energy bills (notably by storing solar energy for export to the grid when grid charges are high), business exposure to short-term fluctuations in prices via half hourly metering can be minimised by combining renewables and storage.

Even more value can be derived from offering useful grid balancing services and providing uninterrupted power (UPS) replacement. As a result, more clients are responding to stand-alone or 'stacked' value propositions that deliver a business case for installing, maintaining and even upgrading renewables/storage systems. This means increasing opportunities for designers and installers, and those who can understand and present the business case itself.

## ARE BATTERIES AT GRID PARITY?

The short answer is no, but it seems we are well on the way. As the whole-life cost/kWh of battery storage converges with the whole life cost of buying grid electricity, there will be many more opportunities for systems designers, installers and service providers.

The economics of battery storage and market drivers are complex, but some commentators suggest that convergence could happen before 2025, with an increasing number of commercial opportunity 'hot spots' before then, notably in the commercial and public sectors.

Batteries still only comprise a small part of the UK's energy storage capacity, but they are expected become far more important in the near future, as costs continue to fall. In December 2017, the Energy Storage APPG headlined that an impressive 12GW of UK battery storage alone could be achieved by 2022, if the government can remove market and regulatory barriers.

Batteries offer excellent capabilities (e.g. around a x10 faster and more precise service response to the grid, compared to turbine generators) and they are relatively easy and flexible to deploy.

Lithium-ion batteries currently dominate the growing market, offering high discharge and recharge rates (ideal for frequency response). However, there are other battery types, with different costs, applications and limitations: not all batteries are suited to delivering power or frequency response, and some are much better at bulk energy storage (e.g. Vanadium flow batteries).

#### EVS TAKE THE STAGE


Up to nine million electric vehicles (EVs) – essentially sizable mobile batteries – are expected to be on UK roads by 2030. This strongly underlines the need for major UK investments in charging infrastructure, along with changes in public sector, commercial and domestic electrical energy demand and supply.

Whether in buildings or wider infrastructure, the nation's EV charging capacity will need to become very smart indeed to support the grid, rather than be a major new – and entirely unsustainable – drain. Smart energy systems will need to incentivise 'vehicle to grid' technology, allowing EV electrical energy to be sold to the network during peak demand, and possibly providing other grid services.

Once again, the growth in EVs implies new and sophisticated installation and commissioning, along with maintenance and even upgrading. Vehicle charging technology is unlikely to stand still and nascent 'flash charging' technology – offering vehicle charging in tens of minutes rather than hours, may herald the upgrade of even

the fastest charging installations currently available.

In August 2018, the government's latest consultation on how to get the best from renewables, storage and EVs pointed to tumbling system prices but also to the urgent need for much smarter deployment of these technologies.

ECA is currently working with partners and members to identify and develop the skills and industry standards that will help members to be at the forefront of the UK's smart, distributed and low carbon energy bonanza. 



Paul Reeve, director of business, ECA

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GuardCam LED is a complete all-in-one, PIR floodlight, camera, speaker and DVR system, which offers an ideal low-energy external area protection solution.

The system is straightforward to install by simply connecting to the mains power, fixing to the wall and setting the time and date via the supplied SD card. Once switched on Guardcam will detect an intruder, floodlight the area, and initiate a high resolution 1280 x 720P video recording directly to an internal SD card. If selected, an audible warning can be delivered, and users have the ability to record their own warning message.

An 8GB card is supplied and there is the capacity for a maximum card size of 32GB. Up to 200 x 20-second video clips can be captured.



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### TRANSFORMER FREE UPS

Power protection specialist, Power Control has released the latest life safety, transformer free UPS range from backup power protection manufacturer, Borri Spa.

Designed exclusively to meet the European compliance standard EN50171, which outlines best practice recommendations for UPS solutions that support life safety equipment, the ECS (Emergency Central System) range from Borri can be used as a CPSS (Central Power Supply System) instead of a distributed power supply. This is hugely beneficial as a CPSS requires less complex electrical design and can reduce maintenance costs.

Borri Emergency Central Systems are available from 10KVA to 160KVA encompassing two models E8031/E8033 ECS (10-50KVA 3/1, 3/3) and the INGENIO ECS (60-160KVA 3/3). Both of these models have been designed in compliance to the international EN50171 standards and the product standard IEC/EN62040. These standards specify obligatory technical features and system testing requirements for UPS systems that are to be used as a CPSS.



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### ONLINE PRODUCT FINDER

Scolmore has added a brand new 'product finder' tool to its website, making it easier than ever for electricians, wholesalers and end users to search and locate products from across all categories, with just a few clicks.

Users select the range they are interested in – wiring accessories, lighting, essentials and Click Smart – and can browse through every category with ease. They can also search by finish, product type, or even brand, adding products to the basket as they go along.

For the electrician, it allows them to create a basket which can then be exported as a CSV file to send to their wholesaler for a quote or a purchase. The electrician can also direct their end user customers to the site to browse the products and create a wish list of items they will need for a particular project. Once end users have finished adding products to their basket they can easily generate a PDF file to send to their electrician.



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### TOUCH OF A BUTTON

Tridonic's Tuneable White system offers lighting scenes at the touch of a button

Tridonic's DLE G2 PRE Tunable White system for downlights provides an adjustable colour temperature range of 2,700 to 6,500 K, to be able to offer the entire white range from warm white to cool white and gives an impressive high colour rendering index of Ra > 90. The system provides a simple way to create dynamic lighting solutions such as Tunable White and human centric lighting applications.

The system is available as a pre-calibrated kit that consists of perfect matched components: a compact LED driver and a Tunable White LED module which allows for a high quality of light and high colour consistency (SDCM 3) while considerably simplifying Tunable White lighting solutions.



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### MODULAR UPS PRODUCT

Uninterruptible Power Supplies Limited (UPSL), a Kohler company, today launched the PowerWAVE 9250DPA – the latest addition to its range of premium, highly efficient modular UPS products.

Designed specifically for medium-sized critical power applications, the PowerWAVE 9250DPA boasts the lowest cost of ownership in its class, delivering module and system efficiency above 97 per cent and significantly reducing typical power losses when compared with similar products currently available. The new UPS also supports 'Xtra VFI', which further minimises power consumption by intelligently configuring the number of modules required to support the current critical load requirements.

The new PowerWAVE 9250DPA supports the latest in lithium-ion battery technology, and the associated energy storage benefits of longer life, lower cooling costs, faster charge/discharge and smaller space and weight requirement.



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### LOOKUP TOOL FOR SMALL UPS SYSTEM BATTERIES

GS Yuasa Battery Sales UK has added a brand-new Uninterruptible Power Supply (UPS) battery search function to their industry leading online battery lookup system. The powerful new lookup feature can be accessed for free at www.yuasa.com and will enhance the way replacement UPS batteries are selected.

The new easy-to-use search function will allow users to quickly find alternative replacement batteries for the original equipment ones fitted in their small UPS systems. Yuasa distributors and businesses can now search for the correct batteries by either make and model, or by a battery cross reference search.

With over 800 UPS machines listed, the make and model search features all major manufacturers including AEG, APC/Schneider, Belkin, Best Power, Eaton and MGE. Once the correct model is identified, the system will provide the correct Yuasa battery and the quantity required.



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# DATA CENTRES CAN EARN REVENUE **AS NEW ENERGY PROVIDERS**

**Why haven't you started?**

Vertiv technologies enable data centres and power intensive facilities to support the grid, bolster the security of supply and reduce energy costs, while financially benefitting from the fast response and capacity market.



**Power Systems = A New Revenue Source:**

A reference 20 MW data centre in Ireland is earning over €1.9 million per year through their UPS systems and diesel generators

Start unlocking new revenue streams through  
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