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OUTPUT

the
connected
world
our digital future

This issue:

Disruptive technologies:
Advances that will transform life,
business and the global economy

The future of computing

A 5G connected future

Gas 2017



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Burton upon Trent
8 November 2017

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Welcome



Contents

Regulars

- 4 Utility Networks News
- 6 HHIC News
- 8 NGVN News
- 10 ICOM News
- 11 HWA News
- 12 MARC News
- 13 Presidents Column
- 32 Leading Voice
Julian David, Tech UK
- 34 New Members

The EUA/IGEM Gas Industry Awards took place in May with over 650 industry colleagues joining us to celebrate the best of our industry. Turn to page 16 to read about the day.

This issue we've take a step away from the industry we work in and looked at how developing technology might affect the many facets of our working and private lives and what innovations might shape the sort of a world we live in over the next few decades.

Drawing on a report compiled by McKinsey Global, we look at technologies they believe will disrupt established ways of doing things and advances that will transform life, business, and the global economy. Harvard Business School professor Clayton M. Christensen coined the term 'disruptive technology', which is technology that displaces an established technology and shakes up the industry or a ground-breaking product that creates a completely new industry.

We can all understand disruptive technologies. The personal computer forever changed the way we work, email transformed the way we communicate, mobile phones make it possible to call anyone, anywhere, the laptop made a mobile workforce possible, smart phones have disrupted cameras, music players, calculators and GPS devices among many other things and social networking has had a major impact through instant messaging.

We've looked at the suggestions by McKinsey Global as well as highlighting a few other potential areas of development and hope you find it an interesting read.

Continuing the tech theme, this issue's Leading Voice is Julian David, CEO of the trade body techUK. In 2015 the internet economy contributed 10 per cent of the UK's GDP and Julian leads a 60 strong team in representing more than 900 member companies, to ensure that the digital tech industry is at the heart of the UK's economy and society.

All this is rounded off with the usual news and updates from each Division. We hope you enjoy the summer edition.

Caroline Haine,
Editor, OUTPUT

Features

- 20 Disruptive technologies:
Advances that will transform life, business and the global economy



- 26 A 5G connected future



- 28 The future of computing



Utility Networks News

all things hydrogen

Peter Day, NEEG Manager

The Network Engineering and Equipment Group (NEEG) meeting in April was all about hydrogen.

Hosted by ITM Power at the Advanced Manufacturing Park Technology Centre in Rotherham, members were updated on the progress of current projects supporting the delivery of low-carbon heat (and power) via hydrogen through the gas grid. The meeting included indoor presentations and outdoor learning experiences.

ITM Power manufactures integrated hydrogen energy solutions. Dr Graham Cooley, ITM Power's CEO outlined their Power-to-Gas systems that convert surplus renewable electricity into hydrogen. The resulting hydrogen can be turned back into electricity, converted to natural gas or used as fuel for hydrogen cars.

ITM Power's first Power-to-Gas plant injected electrolytic generated hydrogen into the gas distribution network in Germany with Thüga and participates in the market for secondary control (grid balancing). ITM Power have supplied electrolyzers to the Orkney Islands as the technology is ideally suited to remote areas and islands with large renewable penetrations. The company has three hydrogen fuel cell vehicle refuelling stations

(HRS) operating in the UK and a further four will be opened this year.

Andy Lewis, Innovation Portfolio Manager at Cadent explained that HyDeploy is a three-year project trialling the use of hydrogen-blended natural gas. Partners Cadent, Northern Gas Networks and the HyDeploy consortium - Keele University, The Health and Safety Laboratory (HSL), ITM Power, Progressive Energy, KIWA Gastec and Otto Simon, have been awarded £6.8 million funding under Ofgem's Network Innovation Competition (NIC).

Mark Wheeldon, Project Manager Innovation and New Technology, for SGN told delegates about Hydrogen 100, a project to determine the viability from both a technical and economic viewpoint, of constructing a 100 per cent Hydrogen network. Three feasibility studies will run concurrently with the same scope but conducted in different locations with very different existing and potential network features.

Study one: Levenmouth, Fife
Study two: Machrihanish Airbase
Study 3: Aberdeen Conference Centre

Dan Sadler leads work on the H21 Leeds City Gate Project for Northern Gas Networks, a study that examined the feasibility of substituting hydrogen for natural gas in Leeds.

It has addressed where and how the hydrogen would be produced, how supply and demand would be managed and what the overall costs for the conversion would be. With news more recently that Northern Gas Networks has opened a dedicated hydrogen project office and the announcement by government of a £25 million programme, committing funding to new research exploring the use of hydrogen for heating, this stream of work is certainly rising in importance.

Members also heard from Adam Madgett, Innovation Portfolio Manager at Northern Gas Networks on their Customer Energy Solution (CES) Strategy.



Attendees took the opportunity to look at ITM Power's Wind Hydrogen Vehicle refuelling station, rode and drove a selection of fuel cell vehicles as well as taking comprehensive tours of ITM Power's technology and electrolyser stack development, covering research, development, product testing and evolution.

Still waiting

Gary Cottrell, EUA Smart Meter Lead

Well here we are again, another issue of Output and we're still waiting for the release of 1.3 in order for the DCC to go live.

Forecasts are for release in July, so we may have better news by the Autumn issue, but of course there still needs to be full end to end testing to give the energy suppliers assurance that everything is operational and stable in order to put customers meters on the system.

As a consequence, other elements of the programme are being delayed. The Smart Meter Device Assurance test scheme (SMDA) is dependent on a fully functional connection to DCC and suppliers will not wish to install devices that do not carry full assurance. Many of them have this as a condition written into their purchase contracts with manufacturers and Meter Asset Providers (MAPs).

Training of meter installers is progressing with newly trained fitters in the field gaining practical knowledge and providing useful feedback for training programmes and quality inspection for the forthcoming mass roll out. However, a large shortfall is still reported in the numbers of installers available and therefore meter installs being completed.

The latest statistics from industry show that over one million meter installs were carried out in Q1 2017. This is great news but means there are still some 40 million to go. EUA has major concerns that the 2020 target for installation is simply not achievable. As we go to print the Queen's speech announced a Smart metering bill to "extend Government's powers on the Smart Metering Programme for five years" so hopefully this opens the door to a sensible review of the completion deadline.

NMi opens new SMDA test facility in Southampton

Correctly performing and secure smart meters and devices will ensure smart metering benefits are delivered to energy consumers, energy suppliers and other industry parties. Assurance that smart metering devices will meet requirements and can be exchanged without impact to other devices will provide confidence and eliminate avoidable costs.

Energy suppliers in liaison with other key players set up the Smart Meter Device Assurance (SMDA) scheme to deliver confidence to consumers, suppliers and financiers that smart metering devices in homes and small businesses work properly.

One of the key aspects of the scheme is to have an independent test house that conducts testing of the devices. NMi was selected to take this forward as the official SMDA Test House at the end of last year.

A new dedicated laboratory in Southampton was opened by NMi offering all necessary testing services for smart metering devices. Manufacturers of smart gas and electricity meters and other devices, such as In-Home Displays (IHDs) and Pre-Payment Interface Devices

(PPMIDs), can have their products tested in this laboratory against a set of test specifications developed by the SMDA Scheme Operator (Gemserv) in consultation with the scheme members. When, after testing, a smart metering device is found to meet the SMDA test specifications, that design will be awarded the SMDA assurance mark and registered in the Device Assurance Register (DAR).



Henri Schouten, Business Development Manager Utilities at NMi explains: "We are proud to be selected as the SMDA Test House and offer those services to support the Smart Metering rollout in Great Britain. In our Southampton lab the smart metering devices will be tested and examined using all necessary Wide Area Network (WAN) and HAN communication technologies and applications. We have also prepared specific equipment for electricity meters to perform the interoperability and interchangeability testing to simulate real life operation using actual electrical load where required. Furthermore, for gas meters a specific rack is installed, producing air flow that will also simulate real life conditions during testing."

HHIC
News**InstallersFirst****Laurah Hutchinson-Strain,
Head of Media, EUA**

If you are an avid twitter user like me (it doesn't matter if you're not, I'll give you the brief) you will have seen how, over recent weeks and months, the plumbing and heating industry have come together with a common goal - to have their voice heard.

Thousands of Gas Safe engineers have joined together to voice their opinion on circumstances within the industry which were seemingly outside of their control; or so they thought. Discussions were had about schemes, training and skills and the odd bit of banter about tools. Whether this 'movement' had an actual effect on its target, or not; what cannot be denied is the camaraderie and sense of power felt by those involved.

Gas Safe engineers need a voice; up, down and across the industry. They need to communicate with each other, with Government, with manufacturers and anyone else who has an influence on their livelihood.

How can they do this? Well, the reality is that they must remain aware of and be prepared to respond to, a variety of changes from external factors. Government policy, European legislation, building regulations, gas safety, the list goes on. It has never been more important for everyone in the industry to get involved and provide a constructive contribution, and by that, I

It's time to think 'Installers First'

don't mean twitter. A well-crafted, well timed tweet may get admiration from their peers for 20 seconds if they're lucky, but in terms of helping to affect actual change that impacts THEIR BUSINESS it's about as useful as waterproof tea bags.

Coming together like they have in recent months is just the beginning. If they are to be properly heard they need links and influences. The good news is that Installers First can provide those links and influences, it costs nothing to be a part of it and the benefits are immeasurable.

Who are Installers First?

Installers First is a community of Professional Accredited Heating Installers. The voice of installers, for installers, by installers.

It provides installers with information and an opportunity to; help shape the industry, Government regulation and policy, making sure common sense and the voice of the industry is applied and listened to.

Installers First was officially launched at Installer 2017 in May. We chose this event as it is a great place to meet the regular installer who just wants to do a good job without barriers.

Installers First - why now?

Installers First was created to provide a platform for Installers to have their say and a single point for information on the latest industry developments, including Government consultations for proposed legislation, regulation and schemes like ECO and Green Deal.

Installers First has been busy gathering industry feedback over the past few months which has been used to identify 3 key ambitions;

- Training and skills - to review and improve current industry access to training and ensure it meets the needs of the job.
- Bureaucracy - simplify the system, utilise industry expertise and experience and improve consumer awareness of Gas Safe.
- Safety and Standards - increase focus on driving up standards across the industry, ensuring safety is paramount.

Why should installers register?

- It gives them a forum for raising industry concerns, with the right people, at the right time
- Because it is free
- Because it is independently operated
- It will help them to keep up to date with Government plans and industry news via a dedicated website, social media presence and Ebulletins
- Installers can have their say by responding to consultations from the Government, OFGEM and other bodies that affect their work
- It provides a link to the wider professional installer community
- Access to boiler manuals, all in one place

Who runs Installers First?

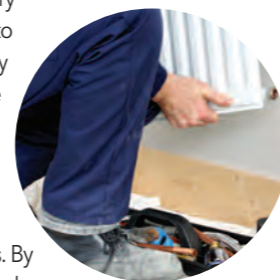
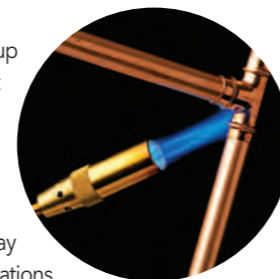
Installers First is administered by the Heating & Hotwater Industry Council, HHIC. Of course, to ensure Installers First is truly FOR INSTALLERS, we have some professionally accredited gas installer champions on board supporting us and feeding into the plans and activities. By coming together, we will make a real change and the voice of the installer will be heard.

Visit www.installersfirst.co.uk and register your email address to stay up to date

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Tweet industry issues using

#InstallersFirst #Installers



What policies can we expect from the 'new' Government?

Stewart Clements, Director, HHIC

The election is over, and the 'new' government has been formed...oh no, sorry, that was what I was expecting to write! Followed by a synopsis of the policy changes the industry can expect over the coming months and years. Now, following June's election result I'm not sure that anyone can predict what will happen next. That said, where there is a hung parliament I can't see much happening that is too radical or different from where we are now.

The downside to that is that at a time when industry is seeking consensus and stability, we are unlikely to get either.

We can expect two things. Firstly, Rt Hon Greg Clark MP is still in place as the Secretary of State for Business, Energy, and Industrial Strategy, (BEIS), so we have some consistency there, and the work streams HHIC were engaged with BEIS on, pre-election, can hopefully be resumed once the reshuffle is completed.

The Domestic Heat Strategy Group - formed in 2015 - is already making real headway into developing effective policy for the decarbonisation of heat. The group has continued to meet regularly despite all of the political uncertainty. This is an encouraging indication that Government remain committed to both working with industry and designing heat policy that works.

The Domestic Heat Strategy Group has created two sub working groups to look at specific topics. They are; the household energy committee, which is looking at EPCs and the possibility of this becoming the energy efficiency 'currency' for the home, and the retro label group, which delivered the 'Retro Boiler Label' - retrospective energy labelling of

old inefficient non condensing boilers.

Secondly, the Conservative manifesto contained two points of significant interest to the heating industry, which we hope are retained;

"With regard to the future energy relationship with the European Union, the Manifesto states that: "After we have left the European Union, we will form our energy policy based not on the way energy is generated but on the ends we desire".

The 'ends' we desire is; secure, affordable and sustainable energy. With over 80 per cent of homes connected to the gas grid. The only sensible, cost effective and deliverable solution to deliver the 'ends we desire' is by decarbonising heat and we do that by 'greening' our gas. It can be done, and is already, on a small scale across the country and it can be delivered effectively.

Estimates by National Grid in their paper "The Future of Gas" shows that around 50 per cent of energy demand for heat could be met by biogases by 2050. This in effect could provide renewable heat to all homes on the gas grid without any action required by the home owner.

These are the type of policies that the 'new' Government should be pursuing. They are cost effective, innovative and provide the best coverage for the cost.

The Conservative Manifesto also pledged to upgrade all fuel poor homes to EPC Band C by 2030, whilst also reviewing requirements on new homes.



HHIC would like to see the reintroduction of the zero carbon homes target which was scrapped in 2015. The rather short sighted move came under then Chancellor George Osborne's economic productivity drive called 'Fixing the Foundations'.

Yes we need more homes, and yes we need to stimulate the economy, but there is no justification for building homes with a permanent legacy of energy bills being higher than they need to be.

Climate change is the single biggest challenge facing us today. If we continue to build homes and buildings that are not as energy efficient as they could be, we are just creating problems for the future.

The UK is currently faced with a huge program of retrofit, to bring the current housing stock up to even just minimum energy efficiency standards. So why are we planning on adding to that problem?

It just doesn't make sense, and if anything it justifies even more rigorously the need for high level engagement between Government and industry. Of course, whether any of these manifesto pledges actually come to fruition is about as clear as mud. After the political merry go round of the last few months; the only thing industry can be certain, is that HHIC will continue to react to the changing landscape.



NGV Network News

The Leyland Story

There's a fuel station just off the M6 in Lancashire which is like no other in the UK.

It is the first in the UK to dispense compressed natural gas (CNG) direct from a high pressure system, to fuel HGVs.

Cheaper financial costs (over the lifetime of a vehicle) combined with massively reduced carbon emissions is leading some involved in the project to label it a 'game changer'. CNG Fuels, in partnership with Cadent, opened the new facility, off junction 28 of the M6, at Leyland, in March 2016. Waitrose, the supermarket group,

which has a distribution centre about a mile from the station, became its anchor customer, operating a fleet of dual-fuel and dedicated CNG trucks.

The fuel dispensed at the station is 100 per cent biomethane, produced through anaerobic digestion as a bi-product of dealing with a variety of food wastes. Waitrose's commitment was further evident in February 2017, when it introduced another 10 trucks to the fleet. The HGVs, which are built by Scania, in collaboration with Agility Fuel Solutions, have a range of up to 500 miles and supply its stores across the North of England and the Midlands.

Cadent is following this trial with huge interest. The UK's biggest gas network is convinced it can prove gas can be a credible alternative to diesel as the fuel of choice for HGVs and buses in the UK. It's one of a number of greener, cleaner, renewable gas projects supported by the company (re-branded as 'Cadent' earlier this month and formerly known as National Grid Gas Distribution).

Although full analysis of the first year's results will follow soon, the indications have been that reduced well-to-motion costs - the true indicator of the carbon footprint of this new technology, from extraction to processing, shipping, distribution, delivery and combustion - are significant.

Compared to diesel, the well-to-tank emissions are as much as 69 per cent lower, and well-to-motion emissions bring savings of 84 per cent. Against biodiesel (derived from used cooking oil), the use of CNG from the Leyland station brings well-to-motion emissions savings of nine per cent.

The Leyland station takes gas directly from the high pressure local transmission system operated by National Grid. Since September 2016, all fuel at the site has been 100 per cent

biomethane, at the same price as fossil gas. The national transmission system has capacity and location (close to motorways) to support a UK-wide chain of CNG filling stations, should the trial prove successful. David Parkin, Cadent's network strategy director, said at the station's unveiling last year: "The benefits are clear: lower emissions, quieter engine noise and competitive fuel prices, compared with traditional liquid fuels."

Philip Fjeld, director of CNG Fuels, said: "Our customers can enjoy a pump price of CNG at our Leyland station that is more than 30 per cent cheaper than the equivalent price of one litre of diesel. Using natural gas also cuts CO2 emissions by more than 20 per cent and, if fleets choose to fuel their trucks with Bio-CNG, they will be running on 100 per cent renewable gas."

The 10 new additions to the Waitrose fleet are said to use 'game changing' technology, helping to overcome concerns about the distance that CNG-powered lorries are able to cover before refuelling. The trucks are the

first in Europe to use twin 26-inch diameter carbon fibre fuel tanks, which store gas at 250 bar of pressure. This increases their range from 300 miles to as much as 500. It will also allow them to run entirely on biomethane, meaning cheaper fuel and reduced CO2 emissions.

Each truck costs 50 per cent more than one which runs on diesel, but Waitrose will recoup the cost in two to three years, through predicted fuel savings of £15,000 to £20,000 per year, depending on mileage. The vehicles are likely to operate for at least five more years, generating overall lifetime savings of £75,000 to £100,000 financially, and 100 tonnes less CO2 every year (vs diesel).

There are many eyes watching this small town in the Red Rose county with much interest. The project could be a flag-bearer for increased usage of renewable gas, and could be a major contributor to the UK's commitment to reduce its carbon emissions by 80 per cent by the year 2050.

Cheaper financial costs, combined with massively reduced carbon emissions is leading some involved in the project to label it a 'game changer'

The project could be a major contributor to the UK's commitment to reduce its carbon emissions by 80 per cent by the year 2050.





Time to get connected



Commercial and industrial heating systems need to 'get connected' if they are to meet the needs and expectations of the smart buildings of the future and their occupants. Ross Anderson explains.

A domestic system is relatively simple from a control point of view. Typically, there is a single appliance controlled through a single control protocol. In commercial and industrial heating systems there are many interconnected items that need to be controlled including, very often, a variety of different heat sources as well as components such as pumps, fans and motorised valves.

In the case of a system using multiple heat sources (boilers, CHP, heat pumps, solar thermal etc.), each with its own onboard controls, experience has shown that trying to harmonise the performance of all of these disparate control protocols can be a recipe for poor performance. A common protocol that can be used across all devices to deliver 'joined up' performance is the key to success.

Moreover, such a protocol should be applicable to all energy-consuming services, so that we move towards what has been termed as a 'new language for energy'.

EEBus protocol

To that end, a protocol called EEBus has been developed and the first version of its interoperability standard was released last

year. The concept is that there is one global language for devices to communicate with each other about energy, and that this language should be freely available to all manufacturers and system developers.

The EEBus approach has two core elements - the data model and the transport specification. The data model is called SPINE (Smart Premises Interoperable Neutral Message Exchange) and this can be transported across multiple communication paths and protocols. The EEBus initiative has developed one particular IP-based transport protocol called SHIP (Smart Home IP). This is based on well-established Remote Function Calls (RFCs), so it can be applied to an existing IP infrastructure.

Internet of Things

EEBus is designed to give energy-consuming devices the widest possible interoperability in the Internet of Things (IoT) and there are currently around 60 companies participating. These companies range across energy, home appliances, telecommunications,

automotive, heating and electronics.

Returning specifically to commercial and industrial heating systems, there are a number of ways in which wider connectivity with the IoT can deliver benefits for end users.

For example, the already common concept of weather compensation using local weather sensors can be broadened by connecting to more distant weather sensors and digital weather forecasting services. Rather than responding to weather conditions just outside the building, this would enable the system to 'look further ahead' in order to fine-tune the performance.

The IoT can also enable more precise control of heating based on parameters within the building, such as occupancy. Occupancy sensors used to control lighting are already being used to monitor occupancy for other purposes, such as space utilisation studies.

This same principle could also be used to predict future internal heat gains from rising or falling occupancy levels. Indeed, there are now 'smarter' sensors that can differentiate between different types of activity and could, for instance, be used to determine how many people are working at computers and therefore adding even more to internal heat gains.

These examples illustrate the growing use of the lighting infrastructure, which is already embedded throughout the building, as a data highway for other types of data. Thus, it reinforces the need for common protocols that can be used across all energy-consuming services, not just the HVAC systems but also in the control of services such as lighting and blinds - as these all have an impact on internal comfort levels and the building's energy performance.

Getting connected

For all of these reasons we can expect to see much higher levels of connectivity between heating systems and other services, making better use of many different data sources to make heating systems more responsive and more efficient. Therefore, there are strong incentives for the commercial and industrial heating industry to not just embrace connectivity but take a pro-active stance in promoting it.



HWA enter next stage of their consumer campaign



Isaac Occhipinti, Head of External Affairs, HWA

Building on a successful campaign in 2016, HWA is due to launch the second phase of its consumer campaign in Autumn 2017.

Project 1 is about utilising solar PV panels to heat hot water. There are currently around one million properties in the UK with PV panels installed, which have the potential to boost efficiency if connected to a hot water cylinder. This message can be used to target retro-fit projects where solar PV is already in place, as well as new solar PV installations. All that is required is a converter to allow solar PV panels to be connected to the cylinder, effectively turning it into an emersion heater.

An additional message here is that homeowners don't have to change their boiler/cylinder system when installing solar PV. Instead they can be used in tandem to provide electricity and hot water as efficiently as possible. Savings can be over £100 per year, and the payback time on the converter

kit is extremely quick. Additionally, combining the two systems can help ensure more homes are future-proofed and renewable ready. The HWA has compiled a new report on solar panels and their effectiveness when used with a hot water cylinder, which will launch in tandem with the campaign.

Project 2 will focus on the benefits of opting for both a boiler and hot water cylinder installation. Building on last year, this consumer campaign is designed to raise awareness of the options available and give homeowners the tools to talk knowledgeably to their installers about the benefits of hot water storage.

The campaign, which includes an online Homeowners hub on www.hotwater.org.uk, will reaffirm the position that hot water storage is a modern choice for UK homeowners, while highlighting the many plus points of opting for a new cylinder, especially when people are in the market to upgrade or replace their existing hot water system, or are in the process of opting for a new build or renovation project.





MARC News

In January 2017 the Government published a consultation into proposals to improve the efficiency of central heating systems in England. Announced by the Department for Business, Energy and Industrial Strategy (BEIS), the proposals included a call for evidence on return water temperatures and the sizing of radiators to improve heating performance in domestic properties.

play in the decarbonisation of UK homes. Radiators have been absent from every energy efficiency incentive scheme to date, and overlooked as an important factor in domestic carbon reduction. This has resulted in millions of homes with old inefficient radiators, often suffering from a bad case of corrosion and sludge build up.

The benefits of an energy efficient or renewable heating system can only be

MARC hopeful that Government will finally join up the dots and include radiators!

A whole house approach to energy efficiency is needed to help reduce carbon emissions. The inclusion of radiators in the consultation is a significant step forward for the Radiator and Convector industry that we hope to see continued. It makes no sense at all to invest in fitting high-end condensing boilers, renewable heating technologies or advanced controls, only to pair them with inefficient and outdated radiators. For too long, heat emitters have been left out of the efficiency equation.

Now that the issue appears to be on the Government's agenda, MARC would like to see radiators included in future policies. The government on the other hand have so far failed to recognise the important role they

realised if the whole system is efficient, including having the right supporting products in place, otherwise a newer heating system can become redundant if it is working with ageing technology. If the UK is to meet its carbon reduction targets, Government must take an all-encompassing approach to energy efficiency.

Including the whole heating system in incentive schemes, and considering what measures a homeowner is most likely to carry out is just the start.

For further information contact Laurah on 01926 513743 or email laurah@eua.org.uk

Presidents Column

Andrew Keating became EUA President on 9 May 2017.

Andrew joined Baxi in September 2011 as Marketing Director for residential boilers. In March 2013 he was appointed Marketing Director for all Baxi businesses in UK and Ireland.

He is responsible for UK strategy, marketing and product management across both commercial and domestic heating and hot water solutions.

Andrew previously worked at Wolseley, B&Q and Marks and Spencer.



How is technology changing marketing?

The Marketing team at Baxi recently won the coveted title of Marketing Team of the Year at the 2017 Chartered Institute of Marketing (CIM) Marketing Excellence Awards. We fought off competition from some of the biggest brands in the UK, including Aviva, Garmin and PwC, to win the title.

I am hugely proud of this win. It is a great achievement and I am so pleased to see the team rewarded for all their hard work and commitment. Leigh Hopwood, chair of the board of trustees for CIM, said: "One organisation demonstrated what is possible if you have the right team, with the right capability, and the right intentions of putting the customer first – Baxi Heating. Many organisations could learn from you."

However, the nature of the function in which we operate is constantly changing and this latest success got me thinking about how technology is changing marketing – and marketers – and how the role might change over the next 10 years or so.

Anyone involved in the marketing of a business knows the sweeping changes new technology has brought to this discipline. There will always be the need for the solid underlying basics of a good marketing plan – clearly defined aims and objectives, originality, creativity, innovation, collaboration and communication with employees, stakeholders, customers and partners – but a certain transformation of marketing is underway.

If we think back 10 years, the Apple iPhone had only just launched. It did not really make an impact initially, as the Blackberry Pearl was the tech to have back then. The number of people with broadband in the world was less than 300 million. Now it's three billion. Mobile broadband penetration in the UK and US was less than 23 per cent and in 2007, Facebook had barely 60 million users. Today it has 1.86 billion. Over the next 10 years, you get the sense that the pace of change will accelerate.

As consumers spend more time on mobiles and tablets the challenge for companies is to connect with customers through all these devices and create campaigns that work across social media, display advertising and e-commerce. The modern-day marketing department needs to combine the creative side of the discipline – real-time conversations with people tapping into people's wishes and aspirations – with the technical side of data, digital engineering and analytics.

Reading around the subject, there is much evidence of companies bringing together their marketing and technology teams for better innovation. Some companies have a cross-functional approach to data, integrating data and insights into every aspect of the business, rather than being owned by any one individual or department.

So what could all this mean for marketing teams? Marketers certainly need to stay in touch with the latest digital developments. They don't necessarily need to know how to write code, but a working knowledge of technology definitely helps. The more you

know, the better position you are in to make intelligent decisions. And it helps marketers to ask better questions as part of their planning.

Amazon's CEO Jeff Bezos made an interesting comment when asked by a reporter, "What do you think is going to change most in the next 10 years?", Bezos' answer was: "That's a good question, but a better question is: what's not going to change in the next 10 to 20 years?"

"When you have something that you know is true," says Bezos, "even over the long term, you can afford to put a lot of energy into it." Bezos' view was that people's wish for lower prices and faster delivery would never change, hence Amazon's total focus on lowering prices and increasing shipping speed with complex automated distribution warehouses and the like.

Just as the iPhone has created a world we could not have imagined, the same thing could happen with a new technology launched this year. But to me, one thing, above all, is important to remember. Regardless of any new technology, human nature is going to stay the same. A good marketer is interested in people: they should always be able to see and understand what their customer thinks, believes and values. Customers will continue to adopt products and services that make their lives better, easier or more fulfilling. Solving customer problems, meeting their needs and, most of all, creating value must remain at the heart of a good marketing team's effort. In every sector meeting needs of their customer is the biggest challenge and the most rewarding.



Ian Campbell,
Chairman, Smart
Connected Homes
and Buildings Group

It is always tremendously difficult to predict technology advances. That is the nature of the industry. Leading technology companies are highly competitive and have large budgets and R&D departments working on the next break-through product or innovation. Small start-ups will sometimes win big but it is the big companies with the big budgets we usually look to for gaining a sense of where the next big thing might be. For consumer markets in the UK it's the GAFA - Google, Apple, Facebook, Amazon - we usually look to for tech innovation.

The "Smart Home" space is the latest battle to commence. With the home changing - growing more interconnected and interactive every day - the strategic importance of this battle is not lost on the big tech companies, all of whom are jostling for the space. Amazon wants a way to own its customer interactions without an Apple phone or a Google Web browser as an intermediary and Apple needs to keep the iPhone at the centre of customers' lives.

Amazon's combination of the Echo speaker system and the Alexa speech-controlled digital assistant offers easy-to-use technology that can control gadgets - lighting, heating, music - in the home with a few spoken words. Amazon is pursuing an open-systems approach that allows quick development of many features.

Apple has built a whole home automation architecture, called Homekit, into its smartphone and seem to be taking a slower route, to assert more control over the technology in order to assure security and ease-of-use. It finally announced the launch

of a smart speaker with integrated Siri - the Apple Homepod - in early June. Google has invested in both intelligent assistant software and home-automation devices - Nest smart thermostat - and launched the Google Home speaker in April. Samsung too launched a SmartThings hub in 2016. At the moment, the industry is characterised more by competition than collaboration.

The most significant development in all of this and where these innovations might exert the most influence, comes from the advancements in speech recognition technology. Spoken instructions have already become the simplest method for running common smartphone tasks - setting quick reminders or asking for directions without unlocking and navigating the device. However, a speech-activated virtual assistant hub in a home is even more user friendly. It doesn't require you to set down your bags, wash your hands, or jumble through your pockets to find your phone.

Speech recognition has been around for decades but until recently has not seen a huge uptake. Spoken words are the most natural and reflexive human medium for communication and as language processing technology continues to improve, it becomes easy to envision speech as our primary interaction point with devices, especially those powering our homes.

Alexa, like Apple's Siri or Google Assistant

can interpret and respond to spoken commands such as "How's the weather?" or "Play Take That?"; however, to date none of the mainstream "voice" enabled smart speakers have been able to identify an individual's voice with certainty. The next step in the battle for the home is likely to be the ability to match the person speaking to a voice sample, or "voice print," which can verify a person's identity. This would provide the sort of security needed to manage financial and legal transactions or parental controls. Earlier this year Google Home added support for multiple users - in essence a convenient way for multiple family members (up to 6) to access personal information such as calendars and music libraries. This works reasonably well as long as no one in your family sounds too similar, but Google are very clear that this enhancement is not intended to manage security; simply to personalise the user experience.

Smart Digital assistants with a whole new level of functionality may well be the first step in bringing voice control into the mainstream and are likely to become the gatekeepers to the rapidly developing Smart and Connected Homes market.

The EUA launched its Smart, Connected Homes and Buildings group last year in order to provide a forum for all of its divisions with an interest in this area. The main aim of this group is to identify how EUA and its members can best influence this rapidly evolving sector and facilitate discussions with key players and industry bodies.

If you would like to participate in this Group please get in touch with
Ian Campbell: ian@bjic.net
07958 356110 or
Gary Cottrell: gary@eua.org.uk
01926 513764



Cadent is the new name for National Grid Gas Distribution and it is now an independent company in its own right. It is Britain's largest gas distribution network helping ensure over 11 million homes receive safe and reliable gas supplies.

Formerly known as National Grid Gas Distribution, the change of name and brand comes after National Grid Plc sold off its majority stake in the company in a £13 billion deal. The newly named company is an independently run business owned by a consortium of investors.

Cadent Chief Executive, Chris Train OBE has over 30 years of experience in the energy sector and has worked in senior roles for its predecessors National Grid Gas Distribution Ltd, Transco and British Gas. He said: "I'm very excited to announce our new name which is inspired by the word cadence which embodies the natural rhythm and energy running through everything we do."

"As Britain's largest gas network we look forward to a strong future ahead, supported by our various partners."

He added: "As a new company with a 200-year legacy we're in a unique position to build on the strong foundations of our past, while encouraging the curiosity to think differently and the courage to embrace change."

issued with new PPE (Personal protective equipment). However, people will continue to see some vehicles, equipment and clothing with the old branding alongside the ones with the new brand over the next 12 months until the rebrand is complete. Chris explained: "As you can imagine we've a lot of vehicles to rebrand and the public will continue to see some vehicles, equipment and clothing with the old branding alongside ones with the new brand over the next year."

As with its predecessor all of Cadent's employees are issued with identity cards. In the event of emergencies or planned gas mains replacement work engineers may need to access peoples properties.

Cadent

your gas network for the future

"Our day to day role will remain the same as will the National Gas Emergency Service phone number and our enquiry line numbers. We'll continue to strive for innovative ways to operate and maintain our network transporting gas safely and protecting people in an emergency."

Cadent employs over 4,500 engineers and specialists working day and night to ensure over 11 million homes keep on enjoying safe and reliable gas supplies. They maintain a network of 131,000 kilometres of pipes across the North West, West Midlands, East Midlands, East Anglia, North London and parts of the Thames Valley.

Rebranding of its fleet of vehicles has already started and employees are being

However, residents should always ask to see these before allowing engineers into their homes.

For more information and to verify the identity of an engineer call the Cadent enquiry line number 0845 835 1111, which is the same number as its predecessor company. (New ID cards will be distributed to Cadent staff from 02/05/17.)

The National Gas Emergency Service number for people to report a gas escape or suspected carbon monoxide, also remains the same and is 0800 111 999.

For more information about Cadent visit www.cadentgas.com

EVENT SPONSORED BY



Welcome to the Gas Industry Awards 2017

I GEM and EUA are proud to recognise the winners and runners up of the Gas Industry Awards 2017.

The Institution of Gas Engineers and Managers (IGEM) and the Energy and Utilities Alliance (EUA) were delighted to once again welcome around 600 gas professionals to this most prestigious of events celebrating the best and brightest our industry has to offer.

We had more than 100 nominations this year, making the job of our esteemed judges an especially difficult one. However, after hours of deliberation, the trophies were engraved and the envelopes sealed, ready for the big reveal at London's Park Lane Hilton on 9 May.

The judging panel, made up of leading figures from across the transmission, distribution and downstream gas sectors, had the difficult task of choosing the shortlist from a stack of extremely competitive entries. We would like to

thank all our nominees for taking part. Special thanks must go to our guest speaker Chief Executive Officer at Cadent Gas Ltd Chris Train OBE, and all the sponsors that made this event so successful.

IGEM President Sheila Lauchlan said: "This year's list of winners and runners up is a masterclass of innovation and ingenuity. As always, the nominees have excelled in demonstrating their professionalism and creativity and it was particularly difficult to choose from such a strong collection. We are fortunate to have such a spectrum of talented people and dedicated companies working in our industry. Congratulations must go to all our shortlisted entrants."

Andrew Keating, President of EUA, said: "The 2017 entries are of the highest quality and accordingly it was extremely difficult to select a winner in each of the categories."

"Thank you to everyone who attended the awards luncheon to see these most deserved winners collect their awards."





Congratulations to the winners



SPECIAL RECOGNITION AWARD
John Baldwin
of CNG Services

John has been a champion of biomethane to grid for over a decade. To get biomethane to grid off the ground, John built a company that had the engineering skills to overcome a set of complex technical challenges.

The first commercial biomethane to grid connection in Poundbury was connected to the grid by CNG Services in November 2012. In 2017, it is predicted that almost 100 plants will be connected to the gas grid and virtually all of them will have used CNG Services to some extent to achieve a grid connection.

From 2008, CNG Services worked with the Renewable Energy Association (REA) on developing the Renewable Heat Incentive (RHI) for biomethane injection, the first of its kind in the world, which was launched in 2010.

Steve Roberts, previously Head of Market Intelligence for the Renewable Heat Incentive (RHI) team at DECC, said: "It's true to say the biomethane industry would not be seeing the degree of expansion it is today without John's input. Biomethane injection to the grid could become one of the most important sources of low-carbon heat in the next few years as a result."



SPECIAL RECOGNITION AWARD
Maureen McIntosh
of SGN

As Head of Customer Experience at SGN, Maureen's positive influence is over two key components of any successful business: customer service and complaints.

Maureen's passion and drive to deliver has led to numerous customer satisfaction initiatives which have produced outstanding results for SGN. The company has seen a 30 per cent reduction in complaints and has picked up four prestigious national awards for customer service and complaint handling thanks to her work.

Maureen's 10 out of 10 initiative allowed SGN staff to understand why customer service is important and how to positively deal with difficult situations. This took SGN from potential RIIO penalties of £1.58 million to rewards of £5.1 million last year, plus outstanding customer satisfaction performance scores for 2016/17.



COMPANY OF THE YEAR
Synthotech
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ENGINEER OF THE YEAR
Andrew Musgrave
of SGN
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LEADERSHIP AWARD
Chris Murray MBE
of Xoserve
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MANAGER OF THE YEAR
Terry Carroll
of SGN
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YOUNG PERSONS ACHIEVEMENT AWARD
Jayne Dawson
of Northern Gas Networks
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INNOVATION PRODUCT AWARD
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CUSTOMER SERVICE AWARD
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Your gas. Our network.

Here's to 2018...

The date for next year's event is Tuesday 15th May - add it to your diary now!
For information on sponsorship opportunities please contact natalie@eua.org.uk



Since the Industrial Revolution, technology has had a unique role in powering growth and transforming economies

A report from the McKinsey Global Institute, identified which technologies could drive truly massive economic transformations and disruptions in the coming years. From a review of more than 100 possible candidates drawn from academic journals, the business and technology press, analysis of published venture capital portfolios, and interviews with relevant experts and thought leaders, they reached a final list of a dozen technologies with an economically disruptive impact between now and 2025.

**Advances that
will transform
life, business,
and the global
economy**

Disruptive technologies

This piece of research by the McKinsey Global Institute is really useful for business leaders who need to know what developments are truly big things and understand which emerging technologies might bring new customers, require change to maintain competitive advantage or inspire new business strategies.

Policy makers and societies need to prepare for future technology, too. To do this well, a clear












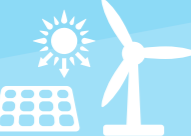
understanding of how technology might shape the global economy and society is required to make decisions on investing in new forms of education or infrastructure.

Governments will need to create an environment in which citizens can continue to prosper, even as emerging technologies disrupt their lives. Lawmakers and regulators will be challenged to learn how to manage new capabilities and protect the rights and privacy of citizens.

Over the next few pages a number of these technologies are reviewed in a little more depth.

The report assessed each candidate according to four criteria, eliminating some that were too narrow and others that seem unlikely to start having significant economic impact within the time period. The technologies identified have the potential to affect billions of consumers, hundreds of millions of workers, and trillions of pounds of economic activity.

The 12 potentially economically disruptive technologies

	Mobile Internet	Increasingly inexpensive and capable mobile computing devices and Internet connectivity
	Automation of knowledge work	Intelligent software systems that can perform knowledge work tasks involving unstructured commands and subtle judgments
	The Internet of Things	Networks of low-cost sensors and actuators for data collection, monitoring, decision making, and process optimization
	Cloud technology	Use of computer hardware and software resources delivered over a network or the Internet, often as a service
	Advanced robotics	Increasingly capable robots with enhanced senses, dexterity, and intelligence used to automate tasks or augment humans
	Autonomous and near-autonomous vehicles	Vehicles that can navigate and operate with reduced or no human intervention
	Next-generation genomics	Fast, low-cost gene sequencing, advanced big data analytics, and synthetic biology ("writing" DNA)
	Energy storage	Devices or systems that store energy for later use, including batteries
	3D printing	Additive manufacturing techniques to create objects by printing layers of material based on digital models
	Advanced materials	Materials designed to have superior characteristics (e.g., strength, weight, conductivity) or functionality
	Advanced oil and gas exploration and recovery	Exploration and recovery techniques that make extraction of unconventional oil and gas economical
	Renewable energy	Generation of electricity from renewable sources with reduced harmful climate impact



Criteria used:

The technology is rapidly advancing or experiencing breakthroughs.

Disruptive technologies typically demonstrate a rapid rate of change in capabilities in terms of price / performance relative to substitutes and alternative approaches, or they experience breakthroughs that drive accelerated rates of change or discontinuous capability improvements.

The potential scope of impact is broad.

To be economically disruptive, a technology must have broad reach—touching companies and industries and affecting (or giving rise to) a wide range of machines, products, or services.

Significant economic value could be affected.

An economically disruptive technology must have the potential to create massive economic impact. The value at stake must be large in terms of profit pools that might be disrupted, additions to GDP that might result, and capital investments that might be rendered obsolete.

Economic impact is potentially disruptive. Technologies that matter have the potential to dramatically

change the status quo. They can transform how people live and work, create new opportunities or shift surplus for businesses, and drive growth or change comparative advantage for nations.

Mobile Internet

In just a few years, Internet-enabled portable devices have gone from a luxury for a few to a way of life for more than one billion people who own smartphones and tablets. In the UK, just over 50 percent of Web browsing is done on mobile devices and wireless Web use now well exceeds wired use. Ubiquitous connectivity and an explosive proliferation of apps are enabling users to go about their daily routines with new ways of knowing, perceiving, and even interacting with the physical world. The technology of the mobile Internet is evolving rapidly, with intuitive interfaces and new formats, including wearable devices. The mobile Internet also has applications across businesses and the public sector, enabling more efficient delivery of many services and creating opportunities to increase workforce productivity. In developing economies, the mobile Internet could bring billions of people into the connected world.

Automation of knowledge work

Advances in artificial intelligence, machine learning, and natural user interfaces (e.g., voice recognition) are making it possible to automate many knowledge worker tasks that have long been regarded as impossible or impractical for machines to perform. For instance, some computers can answer "unstructured" questions (i.e., those posed in ordinary language, rather than precisely written as software queries), so employees or customers without specialised training can get information on their own. This opens up possibilities for sweeping change in how knowledge work is organised and performed. It is possible that some types of jobs could become fully automated.

The Internet of Things

The Internet of Things—embedding sensors and actuators in machines and other physical objects to bring them into the connected world is spreading rapidly. From monitoring the flow of products through a factory to measuring the moisture in a field of crops to tracking the flow of water through utility pipes, the Internet of



Things allows businesses and public-sector organisations to manage assets, optimise performance, and create new business models. With remote monitoring, the Internet of Things also has great potential to improve the health of patients with chronic illnesses and attack a major cause of rising health-care costs.

Cloud technology

With cloud technology, any computer application or service can be delivered over a network or the Internet, with minimal or no local software or processing power required. In order to do this, IT resources (such as computation and storage) are made available on an as-needed basis—when extra capacity is needed it is seamlessly added, without requiring up-front investment in new hardware or programming. The cloud is enabling the explosive growth of Internet-based services, from search to streaming media to offline storage of personal data (photos, books, music), as well as the background processing capabilities that enable mobile Internet devices to do things like respond to spoken commands to ask for directions. The cloud can also improve the economics of IT for companies and governments, as well as provide

greater flexibility and responsiveness. Finally, the cloud can enable entirely new business models, including all kinds of pay-as-you-go service models.

Autonomous and near-autonomous vehicles

It is now possible to create cars, trucks, aircraft, and boats that are completely or partly autonomous. From drone aircraft to self-driving cars, the technologies of machine vision, artificial intelligence, sensors, and actuators that make these machines possible is rapidly improving. Over the coming decade, low-cost, commercially available drones and submersibles could be used for a range of applications. Autonomous cars and trucks could enable a revolution in ground transportation—regulations and public acceptance permitting. Short of that, there is also substantial value in systems that assist drivers in steering, braking, and collision avoidance. The potential benefits of autonomous cars and trucks include increased safety, reduced CO₂ emissions, more leisure or work time for motorists (with hands-off driving), and increased productivity in the trucking industry.

Energy storage

Energy storage technology includes batteries and other systems that store energy for later use. Lithium-ion batteries and fuel cells are already powering electric and hybrid vehicles, along with billions of portable consumer electronics devices. Li-ion batteries in particular have seen consistent increases in performance and reductions in price, with cost per unit of storage capacity declining dramatically over the past decade. Over the next decade, advances in energy storage technology could make electric vehicles (hybrids, plug-in hybrids, and all-electrics) cost competitive with vehicles based on internal-combustion engines. On the power grid, advanced battery storage systems can help with the integration of solar and wind power, improve quality by controlling frequency variations, handle peak loads, and reduce costs by enabling utilities to postpone infrastructure expansion. In developing economies, battery/solar systems have the potential to bring reliable power to places it has never reached.

Advanced materials

Over the past few decades, scientists

have discovered ways to produce materials with incredible attributes—smart materials that are self-healing or self-cleaning; memory metals that can revert to their original shapes; piezoelectric ceramics and crystals that turn pressure into energy; and nanomaterials. Nanomaterials in particular stand out in terms of their high rate of improvement, broad potential applicability, and long-term potential to drive massive economic impact. At nanoscale (less than 100 nanometers), ordinary substances take on new properties—greater reactivity, unusual electrical properties, enormous strength per unit of weight—that can enable new types of medicine, super-slick coatings, stronger composites, and other improvements. Advanced nanomaterials such as graphene and carbon nanotubes could drive particularly significant impact.

Advanced robotics

For the past several decades, industrial robots have taken on physically difficult, dangerous, or dirty jobs, such as welding and spray painting. These robots have been expensive, bulky, and inflexible—bolted to the floor and fenced off to protect workers. Now, more advanced robots are gaining

enhanced senses, dexterity, and intelligence, thanks to accelerating advancements in machine vision, artificial intelligence, machine-to-machine communication, sensors, and actuators. These robots can be easier for workers to program and interact with. They can be more compact and adaptable, making it possible to deploy them safely alongside workers. These advances could make it practical to substitute robots for human labour in more manufacturing tasks, as well as in a growing number of service jobs, such as cleaning and maintenance. This technology could also enable new types of surgical robots, robotic prosthetics, and “exoskeleton” braces that can help people with limited mobility to function more normally, helping to improve and extend lives.

Additional Disruptors

The report also suggests 3D printing is at a point where it could see rapid adoption by consumers and for more manufacturing uses.

Renewable energy sources such as solar, wind, hydro-electric, and ocean wave hold the promise of an endless source of power without stripping resources, with solar technology progressing particularly rapidly.

Next-generation genomics marries advances in the science of sequencing and modifying genetic material with the latest big data analytics capabilities. Today, a human genome can be sequenced in a few hours and for a few thousand dollars, a task that took 13 years and to accomplish during the Human Genome Project. Rapid sequencing means scientists can systematically test how genetic variations can bring about specific traits and diseases, rather than using trial and error.

Other technologies on the radar:

Some of the technologies reviewed which did not make the final list but are nonetheless interesting and worthy of consideration include:- Next-generation nuclear (fission), fusion power, carbon sequestration, advanced water purification, Quantum computing, private space flight, OLED/LED and wireless charging.

We are grateful to McKinsey Global Institute for the reproduction of its report. To view and read the full report go to

<http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/disruptive-technologies>



In December 2016 The National Infrastructure Commission (NIC) published Connected Future, a report which advised government on the steps the UK should take in order to become a world leader in the deployment of 5G mobile telecommunications networks. Securing the mobile networks necessary to put the UK at the forefront of this emerging technology will be critical to the growth of the UK economy.

5G is expected to deliver a step change of ultrafast, low latency, reliable, mobile connectivity, able to support society's ever

A 5G CONNECTED FUTURE

larger data requirements as well as wideranging new applications. From connected and autonomous vehicles to an Internet of Things, 5G has the potential to be transformative across a number of sectors including energy, health, transport and education, and will bring new innovations as unknowable today as the mobile apps and services we now take for granted were a decade ago.

The Commission's central finding is that mobile connectivity has become a necessity. The market has driven great advances since the advent of the mobile phone, but Government must now play an active role in making our country 5G ready as quickly as possible.



The Mobile Revolution

The UK mobile market has transformed from a luxury in the 1980s to an essential today. 93 per cent of adults in the UK own a mobile phone, smartphones have overtaken laptops as internet users' device of choice, and there are more mobile devices than people.

Yet the UK's networks are not complete. There are too many digital deserts across



the country and the availability of 4G network is worse than many countries including Albania, Panama and Peru.

Key asks:

The market has driven enormous change - but now Government must take responsibility to secure our digital future, starting with the creation of a strong digital champion backed by a dedicated cabinet committee. Government must ensure the infrastructure in place to deliver 5G across

our major centres and transport networks:

Major roads: Our motorways must have roadside networks fit for the future. The infrastructure should be in place by 2025.

Key rail routes: The railway network must rapidly improve connectivity. This will be best delivered in future by a trackside network. Government should provide a plan by 2017, and the infrastructure should be in place on main rail routes by 2025.

Towns and cities: Local Authorities and LEPs should work with network providers to develop approaches that enable the deployment of the tens of thousands of small wireless cells we expect to need in our urban centres.

What is 5G?

5G is the next generation of mobile. Standards are due to be agreed in 2019 followed by gradual introduction from the early 2020s, but with full deployment unlikely until the 2030s. As well as existing spectrum bands, 5G technologies will use very high frequency spectrum, enabling rapid data transfer speeds and making it easier to download/upload on mobile devices. Where 5G networks are deployed, they will build on and add to the foundation created by previous mobile generations. This will be critical as the high frequency 5G technologies will only be able to transmit data across short distances; high quality wide area coverage will therefore continue to be essential.

The emergence of 5G will result in more complex and interconnected networks. Over time, the boundaries between, for example, fixed connectivity such as Wi-Fi and mobile, will become blurred giving users the sense of always on, high quality and rapid connectivity.

5G will also provide capacity for the many thousands of internet-connected devices,

such as wearable health sensors and will underpin a number of new anticipated applications across a variety of sectors. In the automotive industry, the low latency and high capacity capabilities of 5G will help facilitate the evolution of highly connected and, ultimately, fully autonomous vehicles. And, in sectors as varied as healthcare and gaming, the potential for new services - like real time health monitoring and augmented reality to improve lives and generate growth is enormous.

Realising these benefits will require the deployment of tens of thousands of new small cell mobile base stations connected to fibre optic cables, which will necessitate investment, coordination and removal of a number of regulatory barriers. In order to pave the way towards the vision of an always on, reliable and high speed network, it will be vital to address existing issues, such as areas of poor coverage.

Determining the scale of 5G benefits is necessarily speculative. However, a 2016 EU study estimates that in 2025 benefits from the introduction of 5G capabilities could reach €113.1 billion per year in four key sectors which will be the first users of 5G connectivity: automotive, health, transport and energy.



National Infrastructure Commission report into 5G and telecommunication technology.
<https://www.gov.uk/government/publications/connected-future>





In 1965, Gordon Moore, Intel's co-founder, made a prediction. From careful observation of an emerging trend, Moore concluded that computing would dramatically increase in power, and decrease in relative cost, at an exponential pace.

Moore's Law

Since then computers have improved in line with this prediction, known as Moore's law. Processing power doubles roughly every eighteen months as smaller transistors are packed more tightly onto silicon wafers, improving performance and reducing costs.

This exponential progress is difficult to relate to the physical world, but if cars

had improved at such rates, the fastest car would now be capable of a tenth of the speed of light (1)

The impact is visible all around us. Today 3 billion people have smartphones, each one more powerful than the huge supercomputers of the 1980s. Each year technology is expected to get better and better. But some now say Moore's law is slowing down. Chips are still getting better, but at a slower pace. But the progress in computing is not going to suddenly stall, the nature of the progress will likely change.

Any slow-down in progress in hardware will provide stronger incentives to develop cleverer software, in areas

such as "deep learning" technology for example. The shift to cloud computing, the networks of data centres that deliver services over the internet, is an important area of development along with new computing architectures - specialised chips optimised for particular jobs, such as cloud computing, neural-network processing, computer vision and other tasks, and mean the performance of end-user devices matters less than it did, because the hard work is done elsewhere. (This model depends, however, on fast and reliable connectivity. Those with poor connectivity will be less able to benefit as improvements in computing that increasingly happens in the cloud. Substantial strides need to be made in this area).

What's next?

The next era of computing - succeeding the PC one - is likely to be about smaller, cheaper, more-powerful portable devices and enhanced mobility. On a personal level much of our software and data has moved to huge remote servers connected to the Internet. Our photos, email and music are already on the cloud and software applications like Microsoft Word, and just about everything else we use a computer for, will no doubt be accessible to us wherever we go.

One of the major innovations we are experiencing currently is vastly-improved voice-recognition software. Even Amazon has been taken by surprise by the success of its Echo. This could see the end of typed searches and the keyboard.

Maybe round the corner one simply speaks a question to the always-on Internet and an answer will return from a vast, collectively-produced data matrix. Google searches may seem quaint.

If the increase in computing power has been impressive over the past 20 years, the pace will speed up radically if quantum computing gets going. Traditional computers have a memory made up of 'bits', where each bit is represented by either a one or a zero. A quantum computer maintains a sequence of qubits. It's complicated, but quantum computing harnesses the power of atoms and molecules to perform memory and processing tasks and has the potential to perform significantly faster than any silicon-

based computer. Some say in this phase devices will disappear altogether. We will not have a laptop or a mobile phone. Computers will essentially be everywhere - in walls, on surfaces in chairs, on your body - communicating with one another constantly. Some of the more far reaching ideas say we may even surf the web with nothing but brainwaves.

Widespread adoption of many of these technologies is still years away. And success in all of them will require a confluence of both technological and regulatory progress. Luckily some of the world's leading research agencies and technology companies are on the case.

1 (After Moore's Law, The Economist 12 Mar 2016).



Going underground

Mining for digital currency

Bitcoin is a form of digital currency, created and held electronically. They are produced by people, and increasingly businesses, running computers all around the world. It is a system based on mathematics that requires software to solve mathematical problems and is an example of a growing category of money known as cryptocurrency. Bitcoin has gained a lot of mainstream financial attention recently through its increase in value (current estimates value 1 bitcoin at £2,228). Other major cryptocurrencies include Ethereum, Ripple, and Litecoin.

Bitcoin can be used to buy things electronically and some businesses are beginning to accept them - you can even buy coffee and pizza with bitcoins.

In that sense, they are like conventional money. However, Bitcoin's most important characteristic, and the thing that makes it different, is that it is decentralised. No single institution controls the Bitcoin network. They can be sent from one person to another without the need for a third party such as a bank or other financial institution.

Bitcoin works on a vast public ledger called a blockchain (when you read the word blockchain, think "database" or "list"), where all confirmed transactions are included. As each transaction enters the system, it is broadcast to the network of users for validation. In this way, all users are aware of every transaction ever made, which prevents stealing and double-spending (where someone spends the same currency

twice). It helps maintain trust in the system too. The peer-to-peer computer network that underpins the Bitcoin blockchain is made up of its users' machines, in a similar way that the network underpins BitTorrent, the file-sharing system.

Bitcoin was introduced in 2009 by a mysterious programmer known only as Satoshi Nakamoto, which is thought to be a pseudonym (no-one knows who Satoshi really is). The idea was to produce a currency independent of any central authority, transferable electronically, more or less instantly, with very low transaction fees.

There are three primary ways to obtain bitcoins: buying on an exchange, accepting them for goods and services, and mining new ones. Mining is lingu for

the discovery of new bitcoins. In reality, the new bitcoins are simply reward for the verification of bitcoin transactions. Currently there are around 15 million bitcoins in circulation, increasing by 25 bitcoins every 10 minutes or so. However, there is a finite number of bitcoins, only 21 million are available and the final block is estimated to be found in 2140.

No one knows what the future will hold for Bitcoin as it is mostly unregulated, but that could change if governments become concerned with their lack of control over it. However, the decentralised architecture of the network will make it challenging at best, to regulate. When Bitcoin began in 2009, very little notice was taken of it apart from by the programmers who

followed cryptography discussion groups. Yet the idea caught on and today the number of bitcoins in circulation is increasing and the system is drawing interest from financial institutions.

Some do not think Bitcoin will last as an independent, decentralised entity, using the example of how music streaming has moved from the decentralised model of peer-to-peer file-sharing service Napster to commercial operations such as Spotify and Apple Music. But many believe its size and dominance mean it is here to stay.

For investors they can be extremely rewarding due to their lack of regulation and a value determined entirely by

market demand. They are almost impossible to counterfeit due to their complicated code system that encrypts each and every transfer, giving anonymity and safety. Despite the high stakes cryptocurrencies do seem to be thriving and multiplying and businesses should certainly keep a watching brief.

What is attracting academics and entrepreneurs is the innovation at Bitcoin and other cryptocurrencies core, the blockchain. Many see the blockchain architecture as the template for a host of other applications. Nicolas Courtois, a cryptographer at University College London, describes the block chain as "the most important invention of the twenty-first century".



Leading Voice

background
growth
times
speak
strategy
viewpoint
business
performance
vision
words
comment
people
feedback



techUK

Julian David, CEO, techUK

Julian David explains how the UK has the Opportunity to Invent the Future.

Can you tell us a little bit about your background and what sparked your interest in tech and ultimately led to the career path you took?

I have spent more than 30 years in the technology industry, most of that time with

IBM in various positions in the UK, Europe and Worldwide but also as an independent consultant and working with small companies.

In 2012 I had the opportunity to join the tech industry's leading representative association and lead its transformation into a new organisation that fully reflects the diversity of the sector and is focused on the UK's digital future. We launched techUK in 2013 and as CEO I have the opportunity to work with my team, the industry and government stakeholders to identify how tech can tackle key economic and societal issues, and create a modern economy that works for all.

Can you tell us a bit about techUK? What are the organisations key priorities?

techUK represents the companies and technologies that are defining today the world that we will live in tomorrow. We have more than 950 member companies, who collectively employ approximately 700,000 people. These companies range from chips to clicks and from leading FTSE 100 companies to innovative start-ups with the majority being small and medium-sized businesses.

Technology can help and is helping to make the world a better place for

everyone. Innovation lies at the heart of positive future developments for our economy and society. At techUK we encourage debate on technology and its potential impact, ensuring discussions are properly informed so that the right path for development and implementation is followed.

We want to ensure that the UK is ready to adopt, design and build the technologies which will drive the next digital powered revolution. If we do this, the UK has the chance to invent a truly innovation-led economy that works for everyone.

What is the biggest trend in tech right now?

The big picture tech trend is the scale and pace of change. Scale in terms of the integration of digital technology in every sector of the economy and the necessary focus on resilience and security that this brings, matched to the pace of improvement in the underlying technology, and what this means for businesses, governments and citizens. A range of huge social and economic advancements will be powered by this: autonomous vehicles and smart urban mobility, distributed ledger technology, advancements in artificial intelligence and the delivery of personalised public services.

What impact do you think IoT will have on the energy industry?

The Internet of Things (IoT) is a key building block of a smarter, more flexible and decentralised energy system. This will bring end-to-end benefits whilst allowing us to meet our carbon targets at the lowest cost. From an industry perspective it will also enhance efficiency and produce cost savings - better uptime, reduced maintenance and van roll costs. Critically it is also an opportunity for existing utilities to enter new markets.

The most visible impact for users will come from the potential to take advantage of the market below the meter, with the potential for utility companies to offer more value-added services to users. You can see this in both the connected home in the form of the services being offered alongside smart meters as well as the enterprise market where you can now access device level data on energy use through some technologies.

Of course there will also be challenges, be that from new and different players coming to the market or from disruptive technologies such as blockchain which the sector will need to embrace and adapt to. And all these new developments will put ever more focus on the need for security and trust throughout the supply chain to the customer.

What does the UK need to do to secure digital transformation and become a global digital nation of significance?

I don't think you can ever complete digital transformation. It is ongoing and requires the ability to continue to innovate and adapt to technological advances. Some organisations and countries are better at this than others. In the UK, invention is in our DNA and we have a collective opportunity to harness the power of digital transformation.

The newly formed Government has some considerable tasks to undertake in order to fully embrace this digital revolution. Brexit is a huge challenge but there is an equally important economic and social imperative - how to create a modern and open digital economy for all. To achieve this and ensure we remain at the forefront of digital transformation, the Government should focus on:

- Making Brexit a success
- Achieving economic renewal through a modern industrial strategy
- Building a Smarter State
- Nurturing the skills for the jobs of the future
- Creating a safe and secure digital world

In this increasingly digital era of globalisation, is there enough focus on security, privacy and ethical concerns?

There hasn't been enough serious debate and policy makers have struggled to keep up with the pace of innovation. Trust, for example, is one of the biggest barriers to the take up of new technologies such as the IoT and artificial intelligence. Hiding from these concerns will simply result in ill-informed discussions and delays to important innovations that could provide societal and business benefits for all.

techUK recently published a short paper; Trust Principles for an IoT World that looks to tackle some of these issues and we've welcomed the Government's project into Security by Default of IoT devices. We also have a series of workshops around how the new General Data Protection Regulation will impact different industries and have work underway on data ethics and algorithmic transparency.

It'll be no surprise that I am unashamedly enthusiastic about what tech can enable over the next 5-10 years. But we all need to work together to have an informed debate about some of these big issues to make sure we do deliver an economy and society that benefits us all.



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To find out more about the AA's home services operations visit <http://www.theaa.com>.

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Find out more at www.gazco.com

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Homeserve provides Home Emergency services and repair for domestic heating and hotwater appliances and systems. They join the HHIC Installer Service and Training Group.

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