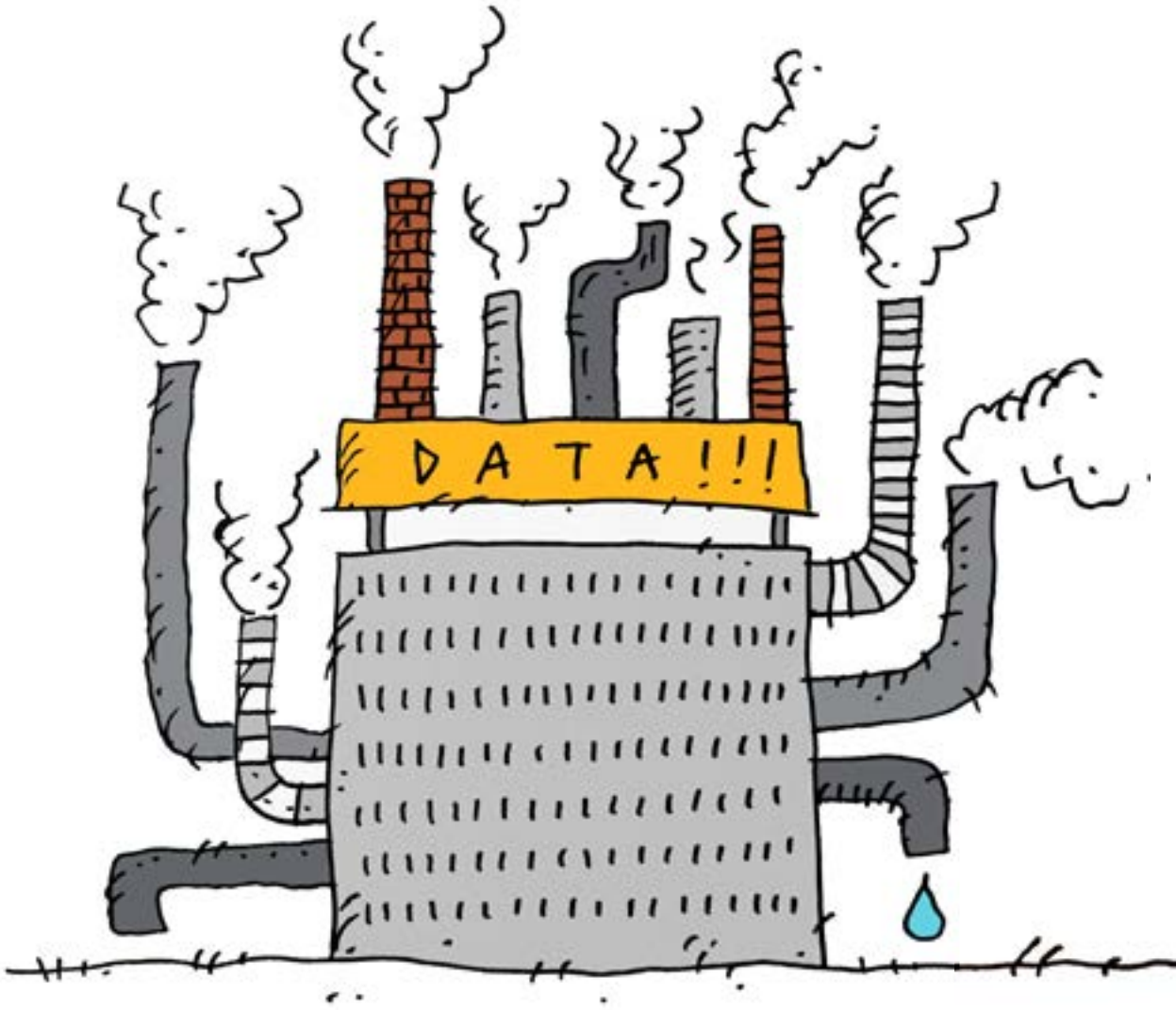
techUK

Ten Myths About Data Centres



Contents

Ten Myths About Data Centres

Data centres are not the most obvious features in our urban landscape and tend to be found tucked away in trading estates or quietly colonising unfashionable industrial sites vacated by the heavy industries of earlier generations. Most people know two things, that data centres have something to do with the internet, and that they use a lot of power. Beyond that, misconceptions flourish, blossoming into a vibrant and colourful mixture of fact and fiction. We've chosen ten common myths about data centres and explained where and why they diverge from reality.

01

Data centres don’t employ anybody

An individual data centre may not have thousands of people on its payroll for day to day running in the way that a steelworks or a manufacturing plant does: that's because its most significant contribution to employment is indirect. Data centres do provide jobs directly in construction and operation, but generate far more within their supply and customer communities. From design to decommissioning, data centres involve a complex and high value supply chain.

From design to decommissioning, data centres involve a complex and high value supply chain.

Once operational, data centres need highly qualified staff to control the physical infrastructure. Some of these will be directly employed, but a commercial data centre provides secure space for customer organisations, whose technicians and engineers will come on site to manage their own IT equipment. Companies running data centres in-house run the IT themselves, although many contract out the facilities management to third parties. So the majority of people working in, on and around a data centre are not employed directly by the operator. Then we have the customers, and the customers' customers whose productivity, competitiveness and market reach are stimulated by the data centre.

In this way a single data centre can support multiple levels of economic activity. This is because data centres are core digital infrastructure. We wouldn't consider a road worthless because people weren't working on it all the time (in fact we much prefer it when nobody is digging it up or coning-off sections). We value it as infrastructure, connecting businesses, government and citizens, speeding up communications, deliveries, journeys. This is how we need to look at data centres, as infrastructure, underpinning our digital economy. Digital infrastructure is currently our most powerful driver of growth and employment.

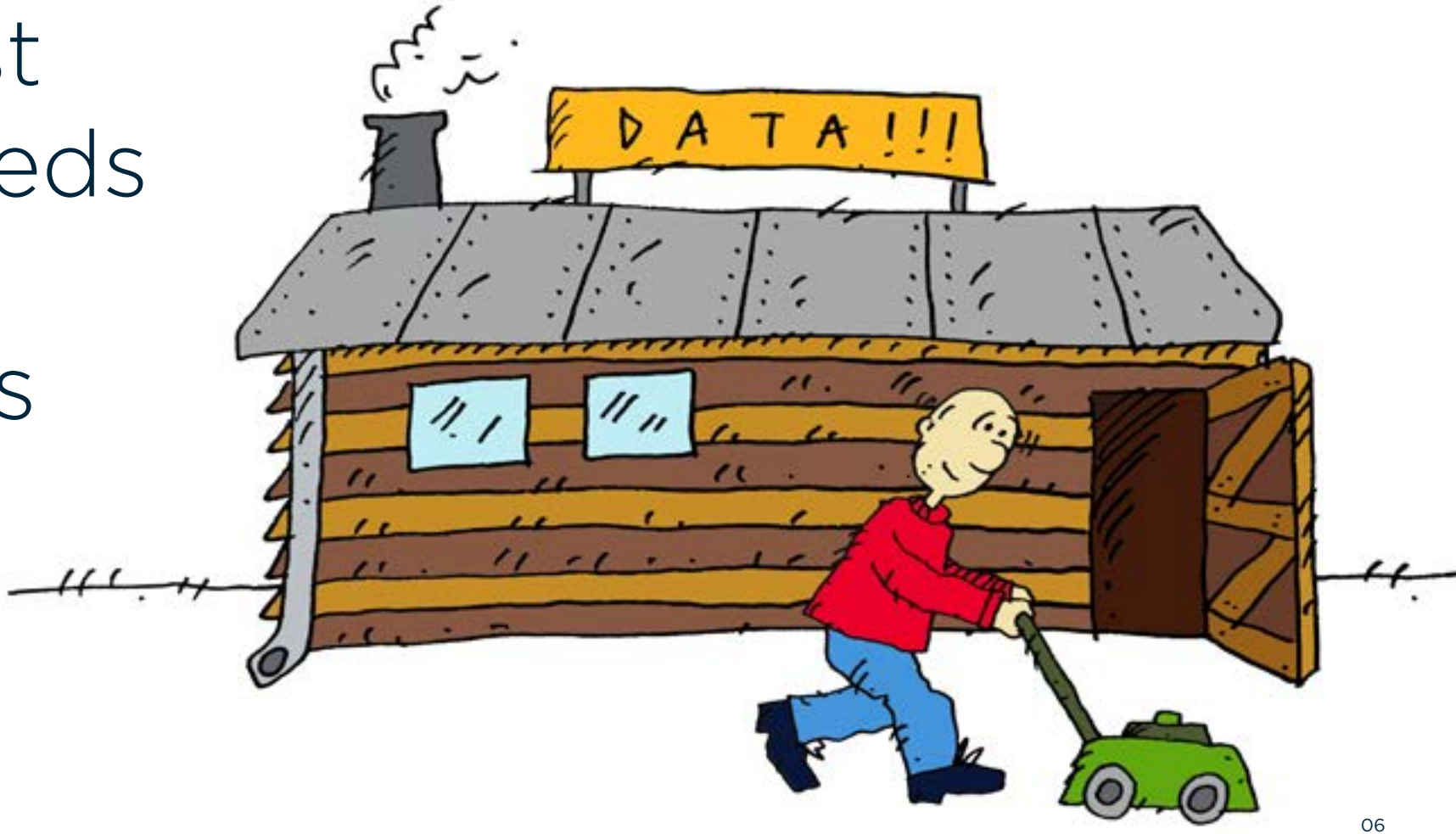
The UK data centre sector underpins a fast-growing internet economy worth £225 Bn and provides the technical infrastructure for financial services, aerospace, transport, healthcare, retail and utilities. Each new data centre contributes between £397m and £436m GVA per year to the UK economy[1].

Data centres are core digital infrastructure. Each new data centre contributes between £397m and £436m GVA per year to the UK economy.

1 https://digitalrealty.box.com/s/bserfy44rne36jxupnnnirdcbwdcvp7f

02

Data centres are just big sheds full of servers



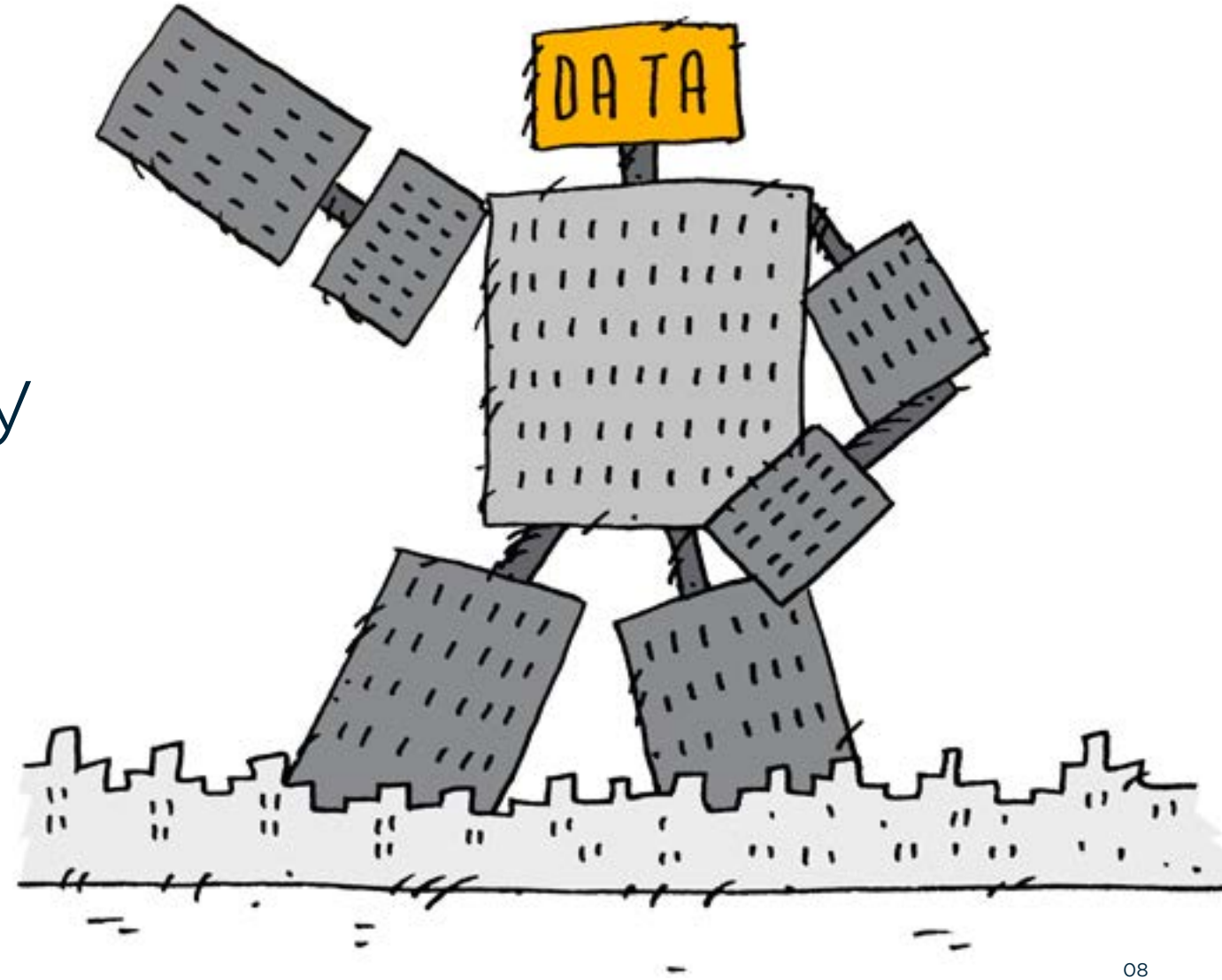
A data centre is not a shed – even if it looks like one at first glance. It is where advanced engineering and digital technology meet. It is the physical manifestation of the digital economy.

While some data centres win architecture awards, more commonly they resemble boring industrial buildings and have been described disparagingly as hangars, warehouses and even sheds. But appearances can be misleading. You might keep tractors in a shed but you don't house servers in the same way that you store farm machinery. This is firstly because, by protecting the servers within it, a single data centre provides critical functions for tens, hundreds, or even thousands of customer organisations that could be located anywhere in the world. Secondly, IT hardware comes with an elaborate support system. So the data centre's nondescript exterior houses a whole array of state-of-the-art technologies; telecommunications networks, sophisticated cooling and ventilation, power conditioning, battery rooms, switchgear, emergency generators, control rooms, biometric security systems, monitoring systems and, hopefully, a coffee machine.

Anyone with planks and a plan can build a shed but data centre architecture and operational design are specialised professions. Each facility is bespoke and costs hundreds of millions of pounds to construct and the sector supports a high value and complex global supply chain. So a data centre is not a shed – even if it looks like one at first glance. It is where advanced engineering and digital technology meet. It is the physical manifestation of the digital economy.

03

Data centre power use is increasing exponentially



Data centre power use is increasing incrementally but not exponentially. The amount of data that we generate, process, transmit and store is increasing faster than ever before, driven by political agendas, the digitisation of business processes, increased outsourcing and consumer preferences.

…in 2018, the UK's commercial data centre sector consumed 2.89TWh of electricity, about 0.8 per cent of our total electricity consumption and 0.3 per cent of our primary energy supply.

You might think that an explosion in data would signal a parallel explosion in data centre energy use. This makes sense in other sectors – if we doubled the amount of cheese we ate, we would need twice as many cows. But data is not cheese. ICT, perhaps uniquely, benefits from a combination of Moore's Law[2], and technologies like virtualisation and cloud computing, which massively increase computing capacity whilst reducing energy consumption. Overall data centre energy use is not decreasing, however: it is gradually increasing. This is because the rate of increase in demand for digital data is faster than the savings achieved through Moore's Law and there is a time lag before new technologies have replaced legacy models. We also have to be aware that Moore's Law can't last for ever, but we can be confident that if power use does start escalating, market and regulatory forces will apply.

It's also important to examine what data centres actually do. Consolidating the computing activity of organisations within data centres delivers IT functions far more efficiently and securely. And in turn, the primary function of the IT they house is to improve productivity and efficiency, enable dematerialisation, deliver policies like superfast broadband, smart grid and other digital agenda commitments. In these cases, data centres enable a net reduction in energy use across the economy, so we need to view data centre energy use in perspective.

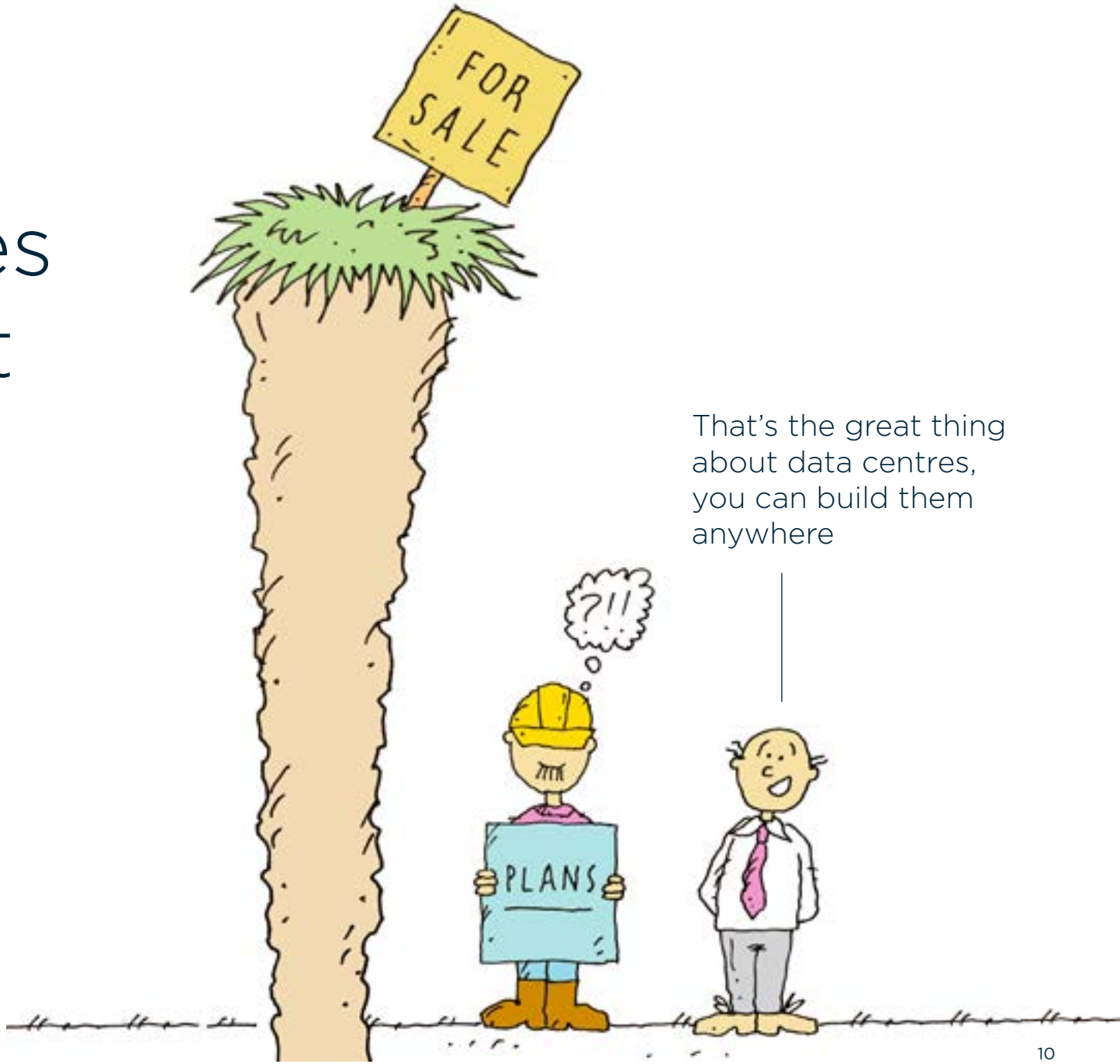
Just for the record, in 2018, the UK's commercial data centre sector[3] consumed 2.89TWh of electricity, about 0.8 per cent of our total electricity consumption which is around 330TWh, and 0.3 per cent of our primary energy supply. It's a very common mistake to confuse energy and electricity. The other thing that most people aren't aware of is that total UK electricity consumption has been decreasing year on year since about 2005.

2 Moore's Law says that the processing power of a chip will double every 18-24 months. Moore's Law also applies to energy. Simplistically the energy required to process a given amount of data is halving every 18-24 months.

3 This data comes from the Climate Change Agreement, which covers commercial facilities including some telcos and IT services providers. It is not complete, and we estimate that if we include the data centres operating in-house this figure will rise to between 6 and 10TWh, which comprises 2-3 per cent of UK electricity.

04

Data centres can be built anywhere



That's the great thing about data centres, you can build them anywhere

Data centres can't be built just anywhere. They need what operators and investors call "Position, Power and Ping" although the order of priority varies depending on the business model. Position is a location near to customers; for financial services it's within 30km or so of the internet exchange / trading platform (this minimises the lag time for data movements and is called ultra low latency). For customers who just want to upload videos of themselves teaching their dogs to tap-dance, "near" can be thousands of miles away. Position may also include access to skills, to land not subject to flooding or other hazards, to infrastructure, to other organisations in the business ecosystem.

Data centres need what operators and investors call "Position, Power and Ping"

Power is electricity – lots of it, and 24/7. The cheaper the better, the greener the better. So Scandinavia is very appealing for large cloud operators whose customers don't need such instantaneous response times.

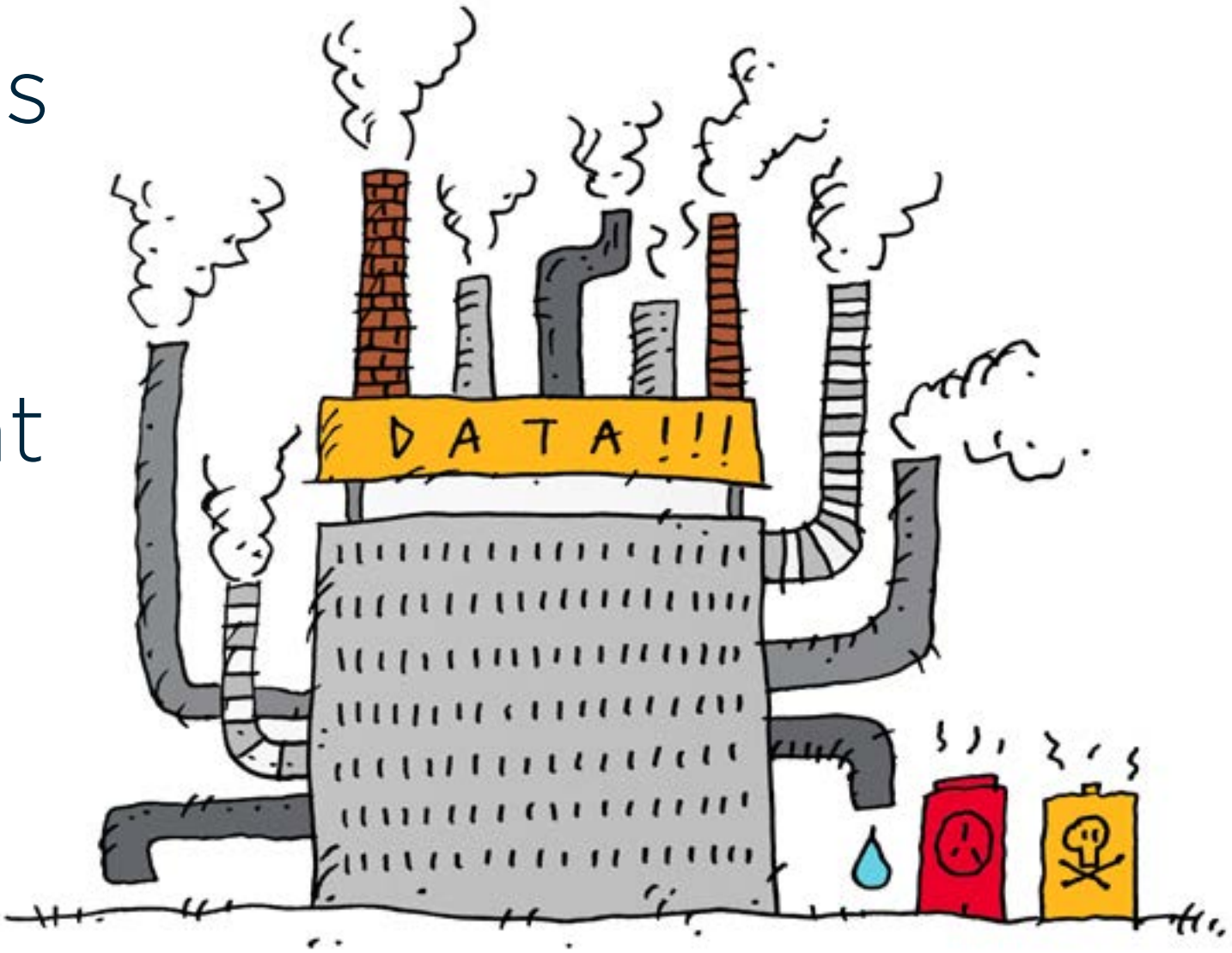
Ping is connectivity – the number of telecoms networks they can access and how much available capacity there is. World class connectivity and demanding financial services customers helped make London the biggest data centre market in Europe.

If these three criteria aren't met, it is hard to justify any large scale commercial data centre build. The rules though are more flexible for organisations whose data centres just support their own corporate IT functions (i.e. enterprise operators). We should also mention that some data centres are successfully operating off-grid through alternative generation and that data centre business models change all the time: Edge data centres may disrupt this model altogether as they will be highly distributed and are likely to be relatively autonomous.

If these three criteria aren't met, it is hard to justify any large scale commercial data centre build.

05

Data centres are bad for the environment



If we want to lead connected lives then we need ICT infrastructure. By consolidating IT functions into efficient, purpose-built facilities, data centres help us deliver our social and economic expectations at least environmental cost. Data centres do consume a lot of power, but energy intensive does not mean inefficient. As well as providing a more efficient alternative to distributed computing, data centres underpin all

By consolidating IT functions into purpose-built facilities, data centres help us deliver our social and economic expectations at least environmental cost.

those ICT enabled technologies that reduce energy impacts across the wider economy. In terms of carbon impact, data centres consume electricity, so they are dependent on the generating mix of their host country. Some types of data centres, particularly hyperscale developments operated by large cloud companies, are location agnostic and can be built in regions where there is a plentiful supply of renewable power – such as Scandinavia. Outside those areas, operators try to procure renewable power: over 75 per cent of power purchased by the sector is certified 100% renewable[4] and larger operators are adopting Power Purchase Agreements.

Data centre emergency generators have the potential to impact local air quality on a temporary basis: although the risks are low because they are hardly ever used, large operators identify sensitive receptors, model and monitor emissions of NOx and other pollutants.

While commercial operators are primarily focused on energy (because they only provide supporting infrastructure), enterprise and cloud providers, who also manage IT hardware, must balance energy efficiency with other sustainability issues like electronic waste and sourcing of raw materials. Getting this right is really tricky, especially as some of the longer-term impacts are not fully understood. The most important thing is ensuring that the disposal supply chain for waste electricals is as closed as it can be, so that elements do not make their way to less developed countries and endanger vulnerable communities. The very largest operators tend to retain control of their IT hardware throughout its lifecycle, but generally, the more consolidated the activity, the easier it is to control waste through proper contracting and chain of custody. A quick glance at the standards, best practice and performance metrics that have been developed by the industry demonstrate the strong emphasis on environmental stewardship.

Data centres also provide a large and ready market for new energy storage technologies, fuel cells and other innovations, helping to drive R&D in these important areas.

4 Source: primary data from CCA operators, September 2019, combined with energy consumption for target period 3.

06

Data centres are all in Iceland (or should be)

Data centres are all over the world. Two of the largest global clusters are in North Virginia and in London

Data centres are all over the world. Two of the largest global data centre clusters are in North Virginia and in London, followed by at least a dozen locations of decreasing size before you get anywhere near Scandinavia, which currently represents a relatively minor market by comparison. Iceland has the benefit of geothermal power, stable government and a highly skilled workforce, so will be an attractive destination for some operators but others will be deterred by particulates and other risks from volcanic activity. In recent years though, the Scandinavian data centre market has expanded very rapidly, albeit from a small base, driven primarily (but not exclusively) by large US Cloud providers seeking land with cheap, renewable power. Iceland, Norway, Denmark and Sweden have been competing fiercely for this business, smoothing planning restrictions, reducing energy taxes and improving connectivity and all have been successful in attracting data centre investments. This makes perfect sense for these operators and we expect to see very strong growth in these regions.

However, data centre operators are not all the same and so the more traditional “metro markets” of London, Frankfurt, Amsterdam, Paris, and more recently Dublin, are preferred locations for other operators, for instance those supporting financial services companies who need world class connectivity (financial transactions and trading activity require close physical proximity to the internet exchange, to minimise any delay on data movements). They also remain attractive to those who want to be part of a larger data centre ecosystem – including those same US cloud companies investing in the Nordic region. In short, it’s a case of horses for courses.

07

Data centres have nothing to do with me

Data centres have everything to do with you, from the moment you get up in the morning to last thing at night. Most people think that data centres are nothing to do with them, and that they are the preserve of government, large ICT companies, and banks. But in reality data centres, and the services they provide, pervade our lives. Often without realising it we now rely on data centres for even the most mundane activities. That means that during even a rather

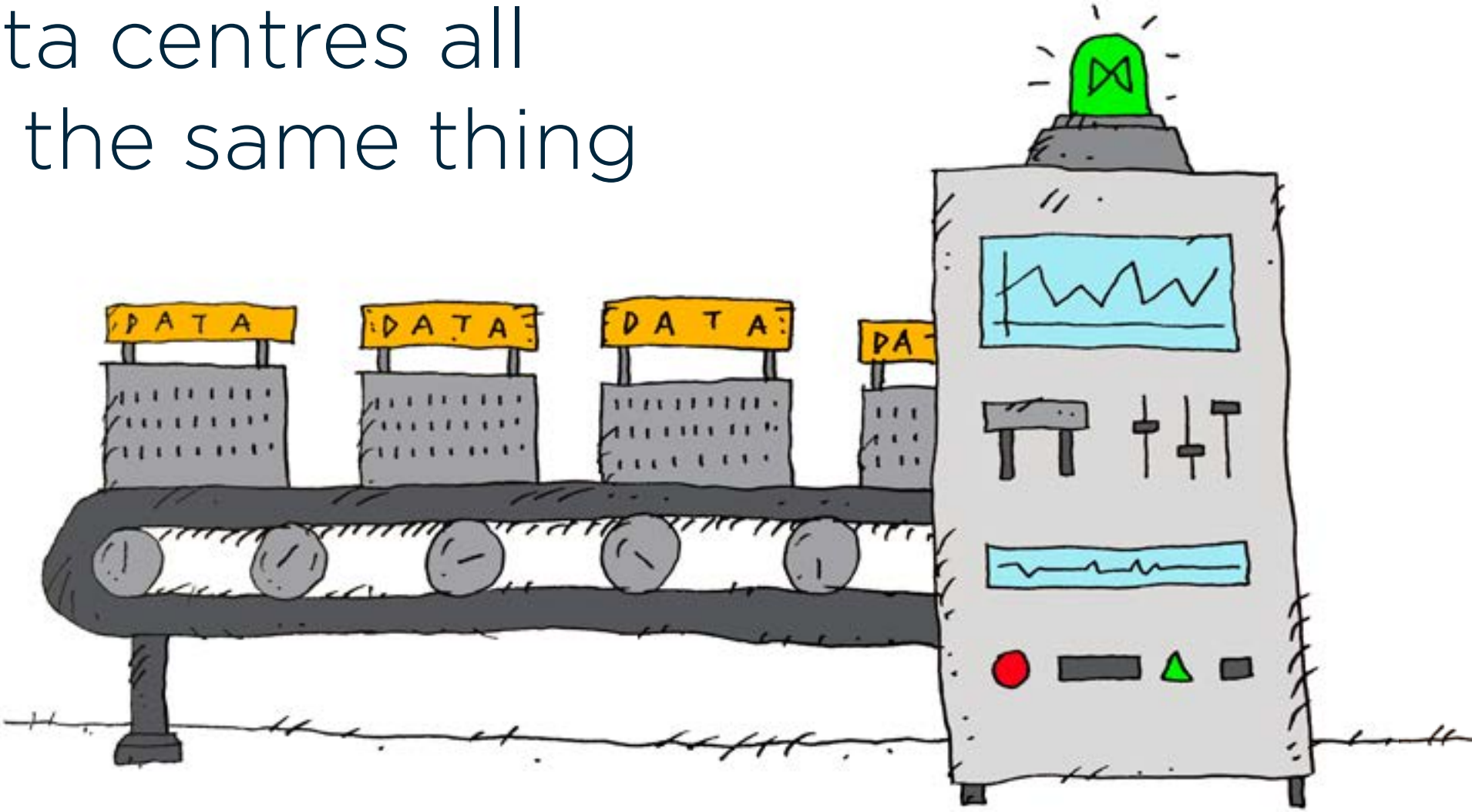
We depend on data centres in the same way that we depend on electricity

boring day, we use data centres dozens, if not hundreds of times: booking a train ticket, driving to work, using an app, receiving a text, sending an email, watching TV, shopping at Sainsbury's (or anywhere else for that matter), paying council tax, visiting the doctor, socialising on Facebook, selling something on eBay, watching YouTube, making a holiday booking, paying the electricity bill, withdrawing money from an ATM, calling our Mum. The list really is endless. So we depend on data centres in the same way that we depend on electricity, it's just that some of us haven't noticed.

Data centres, and the services they provide, pervade our lives

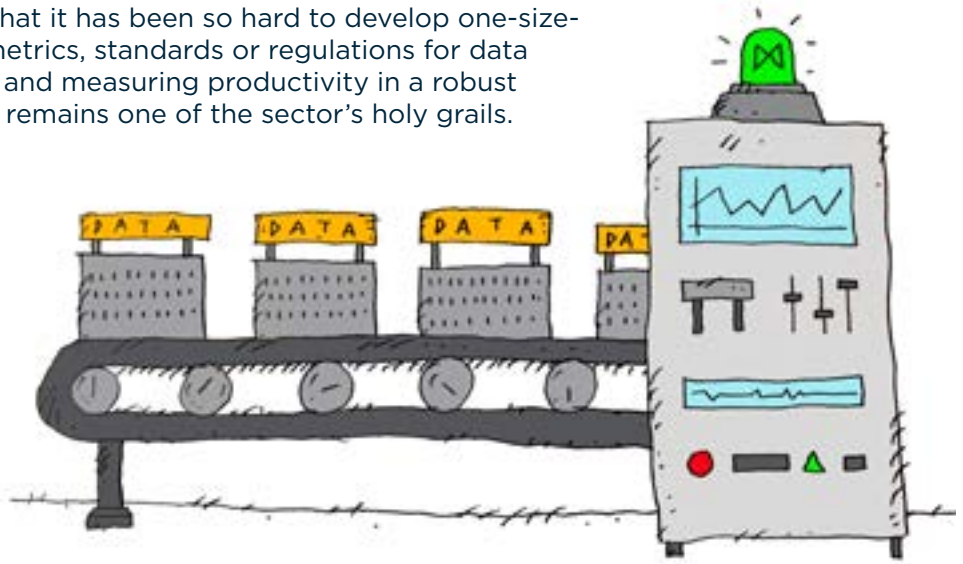
08

Data centres all do the same thing



Data centres do lots of different things. Yes, they all handle digital data of one sort or another but that's like saying that everyone in the food and drink industry does the same thing because they all have something to do with food or drink.

Data centres do lots of different things. Yes, they all handle digital data of one sort or another but that's like saying that everyone in the food and drink industry does the same thing because they all have something to do with food or drink.
Firstly, there are many different data centre business models. Commercial providers (who supply data centre services to customers from banks to supermarkets) present a smorgasbord of different offerings from wholesale colocation to cloud services, and facilities are designed and operated accordingly. Within the enterprise (in house) part of the sector there is a world of difference between a data centre designed for high performance computing, where vast datasets are crunched to inform things like genetic research and weather forecasting, a hyperscale operator offering transactional services like Amazon, one for social media like Facebook, and an on-premises server room that supports corporate IT functions like HR and email. Everything is tailored to function, from security systems to IT hardware. This diversity is the reason that it has been so hard to develop one-size-fits-all metrics, standards or regulations for data centres, and measuring productivity in a robust way still remains one of the sector's holy grails.



09

Data centres are becoming obsolete thanks to the cloud

The cloud is not a cloud, it is a data centre. The truth is that however fluffy and intangible our digital world looks from the outside, the data processing, transmission and storage functions that enable the cloud services that we know and love happen in data centres. Activity may be delivered by virtual servers but those virtual servers do have to come to earth somewhere, and that is on a physical server in a data centre.

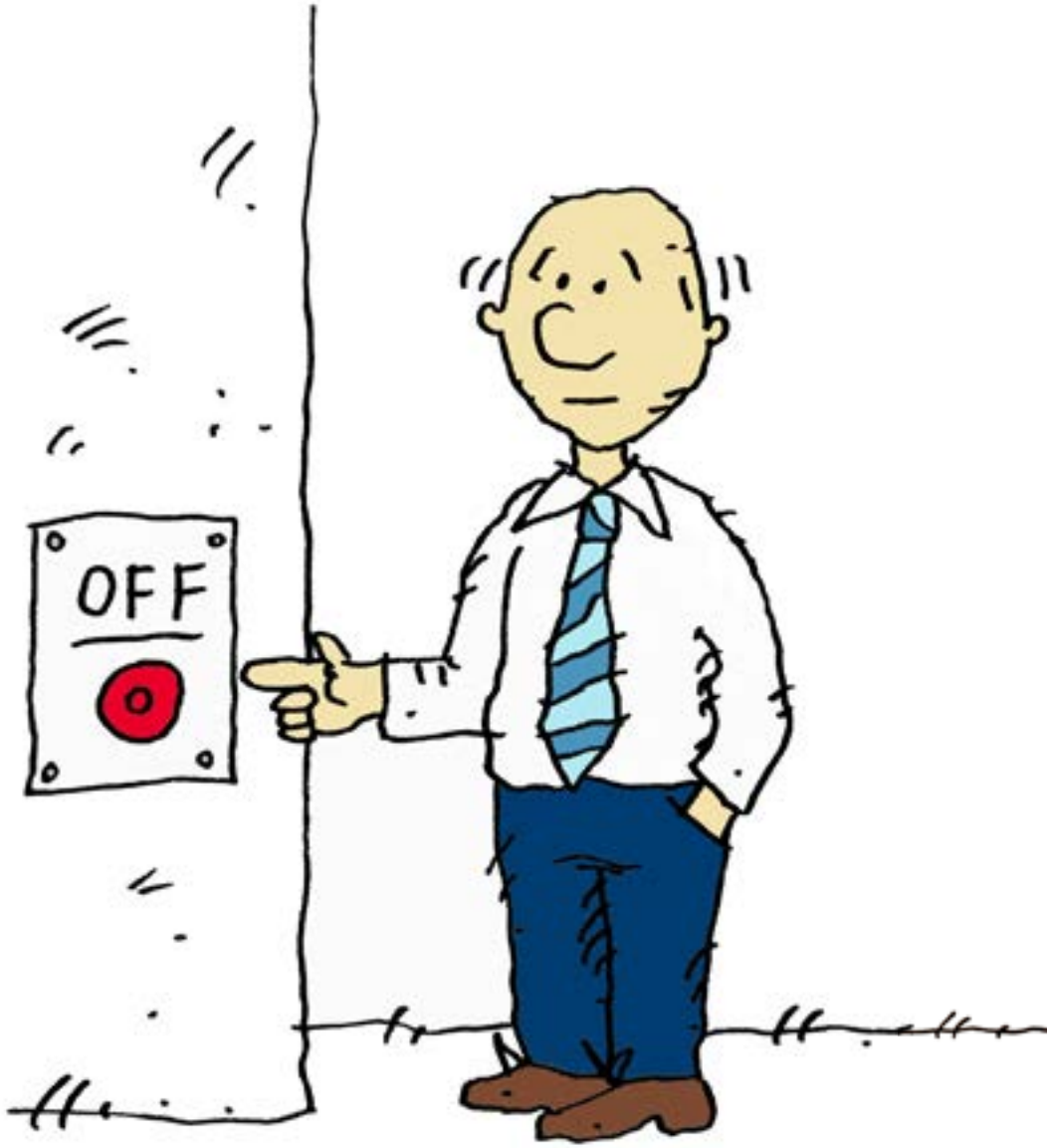
Simplistically, cloud computing is the result of changes in technology and business models over the last decade. A gradual move away from buying products and towards service delivery has characterised the technology sector, with IT functions increasingly offered as packages or as “pay as you go” services. This trend is complemented by consolidation, which concentrates IT functions into purpose-built facilities and by virtualisation, which enables workloads to be shared – and moved - between servers in different locations. This makes best use of available capacity and improves utilisation (how busy the servers are) in turn improving IT efficiency and delivering economies of scale.

Cloud providers may build their own data centres from where they service governments, businesses and individuals, or they may take space in colocation facilities. The very large cloud companies, called hyperscale operators (Microsoft, Amazon, Facebook etc) - tend to build very large campus-based facilities in places like Ireland and Scandinavia. In the UK, however, they are more likely to take space in existing commercial data centres.

The cloud is not a cloud, it is a data centre. The truth is that however fluffy and intangible our digital world looks from the outside, the data processing, transmission and storage functions that enable the cloud services that we know and love happen in data centres.

10

If we switched off all the data centres nothing much would change



Data centres don’t just support those obviously techie things like Amazon, Facebook, Uber and eBay. They are the invisible utility that underpins financial services, retail, travel, healthcare, benefit payments, weather forecasting and entertainment

Data centres underpin almost every aspect of modern life, from social networking to government services, from air traffic control to weather forecasting. Data centres don’t just support those obviously techie things like Amazon, Facebook, Uber and eBay. They are the invisible utility that underpins financial services, retail, travel, healthcare, benefit payments, weather forecasting and entertainment. They also underpin our future because a successful digital economy needs state-of-the-art digital infrastructure. So, turning off data centres is likely to impact things like electricity, fuel and water supply, communications, transport logistics, air traffic control, food distribution, supermarket stock control, medical records, internet, broadcasting, emergency services, financial transactions, security – and that is just for starters. We are so reliant on data centres in our everyday lives that it is almost impossible to envisage a world in which they don’t exist.

And now for the truth

Data centres power the modern economy and underpin every aspect of digital living; business processes, government services and social interactions. Data centres are where science fiction meets reality: they enable space travel, artificial intelligence and machine-to-machine communications. Data centres are behind YouTube, Spotify, Netflix, Facebook, Uber, eBay, Airbnb. Data Centres are where Formula 1 is won – and lost! Data centres drive investment in communications infrastructure and enable smart grid. Data centres stimulate technological development and R&D and provide the processing power for bioinformatics and medical research. Data centres help us model and understand our planet and its atmosphere, from weather forecasting to long term climate change. Data centres are amazing, wonderful things.

The UK data centre sector is a real success story, is globally important, underpins a fast-growing internet economy worth £225bn and provides the technical infrastructure for financial services, aerospace, transport, healthcare, retail and utilities. Each new data centre contributes between £397m and £436m GVA per year to the UK economy.

Further Reading

Data Centres for Tiny Tots

- **Er, What IS a Data Centre?**

  https://www.techuk.org/images/documents/Data_Centres_-_CCA/Note_03_Er_what_is_a_data_centre.pdf

- **Data Centres: Engines of Growth:**

  http://www.techuk.org/images/programmes/DataCentres/engine_of_growth_FINAL.pdf

- **Data centres and power: Fact and fiction:**

  https://www.techuk.org/images/programmes/DataCentres/Data_Centres_and_Power.pdf

- **Data Centres: a Day in YOUR life:**

  https://www.techuk.org/insights/reports/item/274-data-centres-aday-in-your-life or direct to pdf here

- **Why Work in a Data Centre?**

  https://www.techuk.org/images/Why_work_in_a_data_centre_FINAL.pdf

- **So What Have Data centres Ever Done for Us?**

  https://www.techuk.org/images/programmes/DataCentres/So_what_have_data_centres_ever_done_for_us_FINAL_2013.PDF

Environmental Stewardship, Industry self-policing

- **Data centre Standards Map**

  https://portal.techuk.org/my-insights/insight/?id=34fdb93b-8828-e911-a961-000d3ab6dc82

- **Data Centre Performance Metrics for Tiny Tots**

  https://www.techuk.org/images/Data_centre_performance_metrics_for_Tiny_Tots.pdf

Industry data: Energy consumption, Energy Efficiency

- **Climate Change Agreement for Data Centres: Progress Report: Target Period 2 (2017)**

  https://www.techuk.org/images/CCA_Second_Target_Report_04.pdf

- **Climate Change Agreement for Data Centres: Progress Report: Target Period 1 (2015)**

  https://www.techuk.org/images/CCA_First_Target_Report_final.pdf

- **Climate Change Agreement for Data Centres: First Findings Report (2014)**

  https://www.techuk.org/insights/reports/item/2773-climate-change-agreement-for-data-centres

To find out more please contact:

Emma Fryer
Associate Director, techUK
Tel: 01609 772 137
Mob: 07595 410 653
Emma.fryer@techuk.org

Lucas Banach
Programme Assistant
Tel: 020 7331 2006
Lucas.banach@techuk.org

Acknowledgements - Benedicte Fasmer Waaler, Garry Connolly, Carol Mills (lay reader)

Design by Solution Group