techUK Data Centres Programme

Programme Overview 2019

techUK is proud to represent UK data centre operators. Our award-winning programme is comprehensive and influential. Our aim is to ensure that the UK is a place where the sector can flourish. We intervene on policy, we mitigate regulatory impacts and we raise awareness. To date, we have changed UK law and negotiated a tax concession worth over £200M for operators, we have reduced regulatory burdens, identified and mitigated business risks, established a community of interest and shared technical knowledge. We have educated the sector about policy and we have educated policy makers about the sector.

What did we get up to in 2019?

2019 was a year that signalled some significant changes in policy priorities, domestically and internationally. Climate change continued to move up the agenda and the focus on 2050 net zero targets is influencing policy direction. Politically, the two most important developments were the outcome of December's General Election which confirms our exit from the EU, and the accession of a new College of Commissioners over in Brussels on 1st December, who started work on an ambitious and far reaching policy agenda that has the digital technology sector firmly in its sights, from both an environmental and an economic perspective. 2020 is going to be a very busy year.

Major outputs this year included *Ten Myths About Data Centres*, which we also syndicated through our European counterparts, *NOx: Implications for Data Centre Operators,* a position air quality issues, *Lost in Migration,* a discussion paper on attributing carbon to outsourced digital services, and most importantly, our first *Sector Energy Routemap,* setting out how the sector can balance cost, resilience and sustainability and suggesting how data centres can, with the right technologies and policy measures, contribute to the UK's net zero target.

The other major development was the creation of a new Operator-Supplier Forum to share knowledge on issues troubling the sector. Their first task is to look at energy procurement. The rest of our programme was delivered through the usual mixture of meetings, workshops and briefings, lobbying, position statements, consultation responses, guidance notes, discussions papers, by-lined articles, presentations and the odd bit of speechifying.

We saw the introduction of new legislation on carbon reporting and commented on a range of proposals - from funding mechanisms to stimulate industrial efficiency to consultations on improving resilience in the banking supply chain. We continued negotiations on complex issues like EUETS, air quality and eco-design and we lobbied for the CCA to be extended. Its future is still uncertain so this will continue to be a priority in 2020. In the background we plugged away helping members navigate the compliance minefield, explaining why data centres matter and providing a one-stop-shop for queries.

We appeared in Computer Weekly, DCD, Inside Networks, ENDS, Data Economy, Mission Critical Power, the Stack, Business Green and the BBC, among others. We spoke at DataCentre World, at DCD London and at the Swedish Academy of Engineering Sciences in Lulea, at other industry events in Dublin, Manchester and Birmingham and at external stakeholder briefings.

Looking ahead to 2020 our priorities include:

- **Energy:** Implementing the commitments made in the energy roadmap, lobbying for energy cost mitigation, positioning the sector as prosumer in the energy market, promoting best practice.
- **Brexit/ UK competitiveness:** Ensuring the UK continues to be a business environment where the sector can flourish
- **Public Positioning:** Improving external perceptions of the sector
- **Skills:** Tackling the technical skills gap and addressing gender imbalance in the sector
- **Business Risks:** Helping the sector identify and prepare for them
- **Standards:** Promoting standards and best practice and demonstrating that the sector is adequately self-policing
- **Compliance:** Clarifying obligations and reducing compliance burdens for operators
- **Data Governance:** Clarifying risks relevant to data centre operators

2019 Activities and Topics included:

1: New Group:

- Operator-Supplier Forum

2: Publications

- Sector Energy Routemap
- Attributing Carbon to Cloud and Data Centre Services
- NOx: Implications for Data Centre operators
- Ten Myths About Data Centres

3: Policy Developments

- New Commission
- Brexit
- Environment Bill
- Climate Change Agreement
- Streamlining Energy and Carbon Reporting – SECR
- IETF
- Resilience to Severe Weather Risks (Adaptation Reporting)
- IHRS
- Helping Businesses Improve the Way they use Energy

4: Regulatory Compliance

- Updated Compliance Healthcheck
- EBA Guidance: Banking supply chain resilience
- Generator Woes: MCPD and Specified Generator Controls
- More Generator Woes: IED
- Digital Services Tax

5: Other Tissues and Issues

- Energy Security of Supply
- Carbon Taxation: CCC Recommendations
- Standards
- Attributing Carbon to Cloud

6: Tussles with Brussels

- EUETS
- Death by Lot 9
- Green Public Procurement for Data Centres (GPP)

7: Events, Platforms, Press
8: Governance, Further information and Contacts

1 New Group

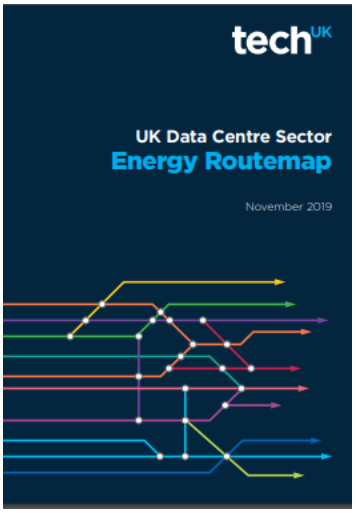
Operator Supplier Technical Forum

We established a new group in 2019, bringing together suppliers and operators to work on sector specific issues. The objectives are 1) to explore, in a non-commercial environment, some of the biggest challenges facing the data centre sector, 2) to demonstrate to external stakeholders that we are proactively seeking ways to improve performance, reliability and sustainability and 3) to share knowledge: raise awareness of strategic issues and promote best practice. The kick-off meeting was held on 29th October to agree scope and priorities. Energy strategy was identified as the first topic, covering issues like procurement options, evidencing renewables purchasing, driving additional generation, power purchase agreements, improving transparency to customer and best practice in reporting. Other topics were earmarked to become the subject of explanatory material. Outputs will include case studies, FAQs and networking events. The next meeting is scheduled for 22nd January 2020 followed by a Show and Tell on 4th March. The first case study has already been published here. Members are welcome to join. Please contact emma.fryer@techuk.org or Lucas.banach@techuk.org.

2 Publications

Beyond our usual bread-and-butter production line of communications, policy responses, opinions and articles, we produced four rather more substantive papers in 2019: our ***Data Centre Energy Routemap***; our first attempt to develop a sector energy strategy, ***Lost in Migration***; a discussion paper on attributing carbon to data centre and cloud services, ***Ten Myths About Data centres***; a debunking of some common misconceptions and ***NOx: Implications for Data Centre Operators;*** a briefing on Oxides of Nitrogen. Here they are.

Data Centre Sector Energy Routemap (November)



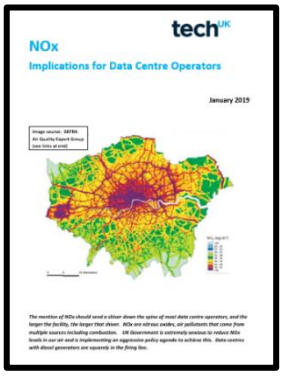
We published the first Sector Energy Routemap on 4th November, launching it at DCD London. It sets out how data centres can balance affordability, reliability and sustainability whilst contributing to the UK's low carbon future. The routemap identifies ten areas for action: strategy and policy, security of supply, energy stewardship, renewables, becoming a prosumer, reporting, transparency, heat reuse, air quality and regulation. In each case we assess progress and identify what needs to be done to deliver positive outcomes. We explain that the sector is well positioned to enable greater adoption of intermittent renewables and finance additional renewable generating capacity. With the deployment of emerging fuel cell and battery storage technologies, data centres could be important energy prosumers in a smarter grid. During 2020 we will be working on the actions we identified and will report regularly on progress. https://www.techuk.org/insights/reports/item/16263-data-centre-energy-routemap

Attributing Carbon to Data Centre and Cloud Services (October)

This discussion paper is the outcome of a long running dialogue between techUK and members of HMG's Sustainable Advice and Reporting Team, (STAR). We were joined by several large media organisations and two carbon footprinting service providers. Government and media both reported that they were struggling to understand the energy and carbon implications of these outsourced services.

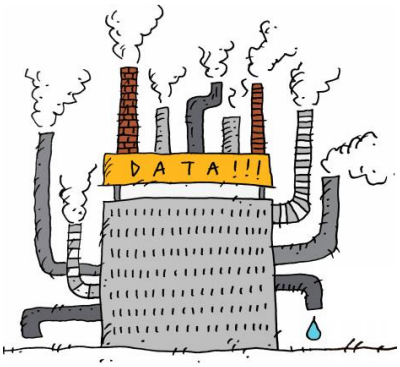
This document explores how we can go about attributing carbon to activity outsourced to third party data centres and providers. The objective is not to advocate cloud adoption or provide a calculation methodology, but to identify ways in which customers can understand these impacts, or at least estimate them robustly enough to inform their decision making. It represents the outcome of our discussions but in reality it is the start of a conversation, not a finished product.
You can find the report here. A shorter version appeared in Data Economy Magazine, November 2019 and a related article appeared in the IET Supplement. We also had a guest blog in BusinessGreen. A workshop to present the report is scheduled for 23rd January 2020. No flies on us.

NOx: Implications for Data Centre Operators (April)



Oxides of Nitrogen, or NOx, are pernicious air pollutants that shorten lives and exacerbate existing respiritory conditions. They are politically sensitive because the UK is breaching local and national levels, primarily due to government policy that encouraged the use of diesel vehicles. All sources of NOx are under intense scrutiny and data centres, with their diesel standby, are firmly in the firing line. Operators, especially those with large sites, must comply with ever stricter air quality requirements and controls (see below under Generator Woes). Even though data centres contribute a negligible proportion of emissions they have the potential to do harm at local level. We produced a briefing for operators explaining what NOx are, why they matter and why data centres need to take note. Not perhaps our most thrilling publication but important nonetheless. You can find it **here.**

Ten Myths About Data Centres (April)



In January we got together with data centre national trade bodies from across Europe, kindly hosted in Amsterdam by DDA's Stijn Grove. Our counterpart at Host in Ireland, Garry Connolly, suggested we produce a list of ten myths about data centres, and the challenge was taken up by ourselves and Benedicte Fasmer Waaler from Norway. We produced two outputs – a short European version and a longer, UK specific version. Myths debunked included "data centres don't employ anybody", "data centres have nothing to do with me" and "data centres are obsolete thanks to the cloud".

The full version is on our website here. The short version appeared in the May edition of Data Economy

3 Policy Developments

New Commission

The New College of EU Commissioners started work on 1st December and the ambitious five-year programme set out by Commission President Ursula von de Leyen (pictured) has far reaching implications for data centre operators and for the digital technology sector at large. There is much talk of digitisation and of infrastructure development but also of greater control and ownership of digital technology in Europe. See our opinion in DCD magazine setting out the implications of the new programme and the new structures implemented by von de Leyen to coordinate delivery. You can find the same piece on our website here. Expect existing climate change legislation to tighten and new instruments targeted at digital technology.

Brexit

We monitored progress closely during a tumultuous 2019 and now we have a new government with a large majority, everyone expects a very busy 2020. Our policy priorities have not changed and we continue to lobby hard for an adequacy agreement and for government to recognise the importance of digital services to the UK's economy. We have not produced a data centre specific Brexit report since our Silver Linings report and update back in 2017: too much political volatility. However, 2020 may be a good opportunity for an updated sector position.

Environment Bill

The government published its flagship Environment Bill, summarised in DEFRA's policy statement in October. Policies of most relevance to data centres relate to targets and emissions and air quality, where local authorities are to be given greater control. Bearing in mind the conflicts we are already seeing between local and national requirements; we will be monitoring this in 2020.

Climate Change Agreement

We continued to lobby hard for government to reopen the CCA during 2019. BEIS appointed consultants to evaluate the scheme; we contributed to stakeholder events, completed surveys, interviews and questionnaires. We explained that signals of support are critical for our electro-intensive sector, we emphasised how mobile data is, how the scheme has improved energy stewardship and provided invaluable data on energy consumption. Our three formal CCA reports (First Findings, Target 1 and Target 2) came in handy here and we know they were referenced. The consultants will be submitting their findings to BEIS imminently and we expect a response and a formal consultation on the future of the CCA later in 2020. Our biggest concern is that a future scheme will be limited to sectors on the EII (Energy Intensive Industries) list which does

not include data centres, or disappear altogether. Our fourth CCA report, assessing progress against our third sector target, will be published in Q1 2020, so look out for that.

On a more positive note, we were delighted that the sector collectively passed its third CCA target milestone, and in fact, delivering over 16% reduction in PUE, met its final target two years early. However, the real picture was very mixed. Over half the target units failed and some paid substantial buyout fees to remain in the scheme. The main reasons for missing targets were reduced IT energy demand and loss of enterprise clients due to Brexit uncertainty.

Streamlined Energy and Carbon Reporting: SECR

Back in 2018 we contributed to a wider techUK input to BEIS on their proposals to streamline carbon reporting, which did not really involve much streamlining and instead seemed to add plenty of unnecessary bells and whistles. BEIS have since finalised the regulation which came into effect on 1st April so businesses obliged under the requirements must start to think about reporting. We held a briefing session in September where Julie Gartside from SLR Consulting kindly demystified the new regulations for members. With further help from SLR we are developing some guidance to help with sector specific issues like recharging energy and "opco-propco" relationships. Look out for that in Q1 2020.

IETF: The Industrial Energy Transformation Fund

This £315 million IETF is to help decarbonise energy intensive businesses. It targets larger, capital intensive projects that would not be delivered under normal market conditions. The fund cannot address the biggest opportunities for energy savings in data centres (consolidating distributed IT for instance) being focused on plant and equipment. Moreover, BEIS is considering limiting it to manufacturing sectors. We submitted input to the pre-consultation call for evidence in June and responded to the consultation itself in November. We suggested that funding should not be limited to certain pre-ordained sectors but judged by merit. We organised a follow-up call with BEIS in December so operators could explain the industrial nature of the sector and identify projects that such a fund might facilitate. We will try to ensure that the sector does not miss out.

Climate Change Adaptation (Resilience to severe weather risks)

We continue to work with DEFRA and the Environment Agency on sector readiness for climate change risks such as flooding and high temperatures and report regularly under the Adaptation Reporting Power (ARP), part of our National Adaptation Programme. Work on the third round has started and we will build on our earlier report submitted for the second round and assess progress on its recommendations. We will also accommodate the issues we raised on heatwaves in our input to the Environmental Audit Committee's Inquiry. We will coordinate ARP work with the ECRRG (Electronic Communications Resilience and Response Group) who cover telecoms. We will be hosting a briefing session for members on climate change risks and resilience in Q1 of 2020, so look out for that.

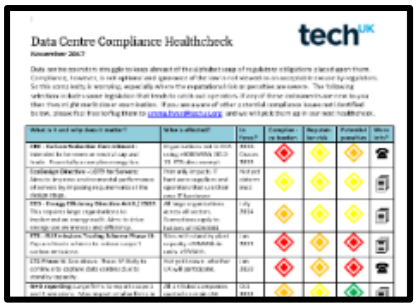
Heat Reuse: IHRS – Industrial Heat Recovery Support

The reuse of waste heat from data centres is something we are quizzed about constantly but lack of infrastructure, scarcity of customers, the low grade of heat available and the cost of collecting and concentrating it mean that successful projects are rare in the UK. Back in 2018 we negotiated with government to include data centres in their IHRS programme which aims to address some of these barriers, and several operators took this up in 2019. We will find out how they got on in 2020. Relevant outputs include a response to govt's initial call for evidence, an informal position in 2018 followed by a briefing with the consultants on the programme.

BEIS Call for Evidence: Helping Businesses Improve the Way they use Energy

After a disappointing consultation that included some important systemic misconceptions and incorrect assumptions the Government published their formal response in March 2019. Other stakeholders clearly shared our view on the importance of the CCA and on the shortcomings of some of the other policy instruments in place, and while there was acknowledgement that electricity costs were high, there was little of substance for electro-intensive industries. We will continue to monitor this space but there is little to be optimistic about.

4 Compliance


Data Centre Compliance Healthcheck

techUK

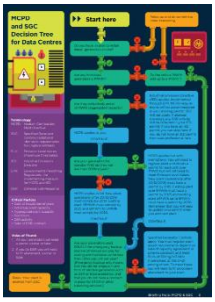
Compliance Healthcheck

Our Compliance Healthcheck provides a quick heads-up on a selection of compliance requirements for data centres, grading them in terms of their burden, potential penalties and reputational risk. We updated it in March 2019 to remove the CRC (hooray!) and add new instruments like SECR and European Banking Association Guidelines (see below).

Operational Resilience: European Banking Association (EBA) Guidance & Consultation

Earlier this year the EBA issued guidance on supply chain resilience in the financial sector. This has implications for operators servicing banks and other financial services customers – additional requirements and greater scrutiny may be imposed. The relevant consultation has now been published. While we ponder our response, Charles Russell Speechlys has published some helpful briefing material. Our thanks to Mark Bailey for that.

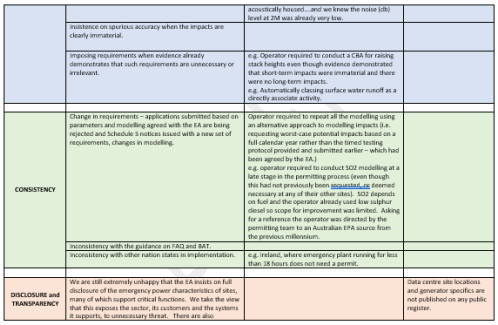
Generator Woes: MCPD and Specified Generator Controls


MCPD and SGC Decision Tree for Data Centres

Start here

We continue to monitor the implementation of the gratuitously complex MCPD and Specified Generator Controls which came into force in the UK in 2018 but are still settling down and generating confusion. Formal guidance remained in draft form well into 2019 to allow for changes and can be found here for MCPD and here for SGC. While the EA Guidance should remain the first port of call, we published a decision tree and briefing notes for data centre operators.

More Generator Woes: IED



		acoustically housed…and we knew the noise (db) level at 2M was already very low.	
	Insistence on spurious accuracy when the impacts are clearly immaterial.		
	Imposing requirements when evidence already demonstrates that such requirements are unnecessary or irrelevant.	e.g. Operator required to conduct a CBA for raising stack heights even though evidence demonstrated that short-term impacts were immaterial and there were no long-term impacts. e.g. Automatically classing surface water runoff as a directly associate activity.	
CONSISTENCY	Change in requirements – applications submitted based on parameters and modelling agreed with the EA are being rejected and Schedule 5 notices issued with a new set of requirements, changes in modelling.	Operator required to repeat all the modelling using an alternative approach to modelling impacts (i.e. requesting worst-case potential impacts based on a full calendar year rather than the timed testing protocol provided and submitted earlier – which had been agreed by the EA.) e.g. operator required to conduct SO2 modelling at a late stage in the permitting process (even though this had not previously been requested…or deemed necessary at any of their other sites). SO2 depends on fuel and the operator already used low sulphur diesel so scope for improvement was limited. Asking for a reference the operator was directed by the permitting team to an Australian EPA source from the previous millennium.	
	Inconsistency with the guidance on FAQ and BAT.		
	Inconsistency with other nation states in implementation.	e.g. Ireland, where emergency plant running for less than 18 hours does not need a permit.	
DISCLOSURE and TRANSPARENCY	We are still extremely unhappy that the EA insists on full disclosure of the emergency power characteristics of sites, many of which support critical functions. We take the view that this exposes the sector, its customers and the systems it supports, to unnecessary threat. There are also		Data centre site locations and generator specifics are not published on any public register.

The Industrial Emissions Directive applies to sites with over 50MWth of generating capacity (around 17MW electrical output). Obtaining an IED permit is costly, complex and time-consuming. Operators obliged under the scheme reported shortcomings with the permitting process. On 8th May we hosted a round table which produced a long list of issues that are slowing the compliance process and adding significant cost. Key issues relate to evidence and the way it is handled, consistency, communication, proportionality, timeliness, objectivity and relevance. We organised a face to face meeting with the EA in December which led to a lively exchange of views. They have agreed a route for escalation, and we will develop best practices for operators. We are working together to address CO monitoring requirements that are likely to be impractical. We still believe that the IED burden is disproportionate to the policy outcome but we are not winning the argument. Unfortunately, operators do have the potential to affect local air quality, so it is important that large sites identify vulnerable receptors in their area, model potential impacts and ensure that plans are in place to mitigate where possible and inform stakeholders. This dialogue will grind on into 2020 and beyond. We also produced our briefing on NOx (see above) to provide more context for our earlier position statement on compliance.

Digital Services Tax


techUK response

With spectacularly bad timing, UK government chose 2019 to make tech firms feel unwelcome in the UK by proposing a unilateral digital services tax from April 2020, ahead of global taxation reform, to address the "challenges that large digital services companies present to the international corporate tax system". While it seems to make sense for businesses not captured by domestic tax regimes to pay tax where profit is generated, we are concerned that general terms like "marketplace" and "customer" in the consultation could capture activities beyond the intended targets of the legislation. It is conceivable that certain data centre infrastructures or services, e.g. interconnection, could be viewed as a type of marketplace between customers. A robust response was submitted. The consultation is here.

5 Other Tissues and Issues

Energy Security of Supply

Operators were worried about the impact of Brexit on future generating capacity. In Q1 we sought advice from BEIS and explored the supply market to assess the effect of a No Deal exit on electricity supply. In broad terms, Brexit looks unlikely to affect security of supply in any major way: this doesn't mean that the lights can't go out, just that if they do, it's unlikely to be directly attributable to our departure from the EU. However, changes in the way energy is traded could increase prices. We produced a briefing explaining our energy market and outlining impacts of different Brexit scenarios. Government also published a technical briefing on energy suppliers on 6th February which you can find here. ICoSS, (Industrial and Commercial Shippers and Suppliers Group) has also produced a useful Brexit Assessment, here.

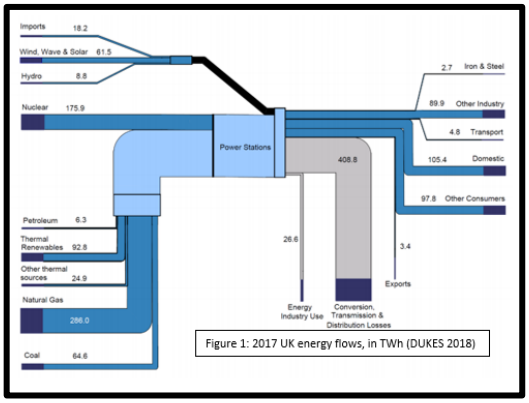
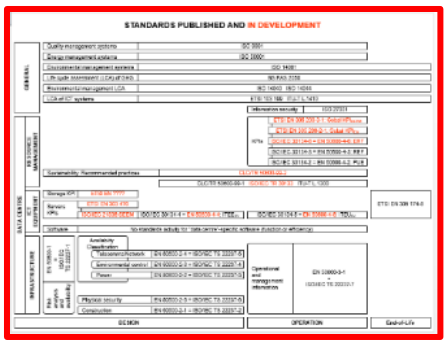


Figure 1: 2017 UK energy flows, in TWh (DUKES 2018)

Energy taxation: CCC recommendations to Government on carbon pricing

The CCC published its recommendations to Government on carbon pricing in 2019. The CCA influences the direction of travel in terms of policy initiatives so it is worth being aware of what they are saying. Their key recommendations are that: Government should not rely on carbon pricing alone. Whilst carbon pricing is essential it needs to be used as part of a suite of policy instruments. They support a linked UK-EU ETS post Brexit. They recommend that the cap of the linked UK ETS be set based on the cost-effective path to the UK's new net-zero target. We will monitor.

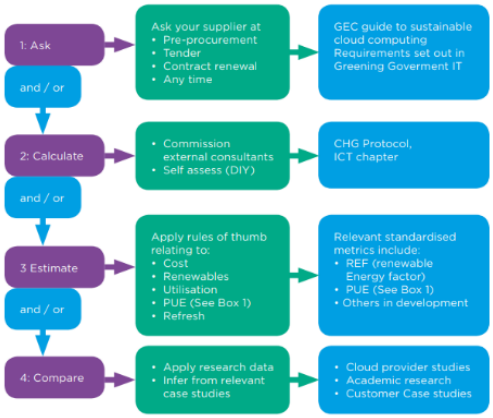
Standards



In 2019 we began a rather overdue review of our Data Centre Standards Map and our Tiny Tots Guide to Performance Metrics. Several performance metrics have since become standardised and there are new standards and technical reports to register. This work will continue into 2020. We continue to sit on BSI TCT 7 and on CENELEC's Green Data Centre Coordination Group, which harmonises the plethora of emerging and existing standards, technical reports, specifications and KPIs. During Q1 we helped BRE quiz our members to evaluate an update of BREEAM for data centres: they have since decided not to continue with a bespoke offering as the landscape has changed. We also commented on a survey by Keysource, which revealed some surprising divergences between supplier and customer communities on standards.

Efficiency of cloud computing / Attributing carbon to cloud and data centre services

The EU initiated a major study on the efficiency of cloud computing. "Energy-efficient Cloud Computing Technologies and Policies for an Eco-friendly Cloud Market". We completed a survey and engaged with the consultants, the Austrian Environment Agency who were asked to identify policy measures to improve the efficiency of cloud computing. A first stakeholder meeting was held in September, about 21 policy proposals were developed and reviewed at a second meeting on 4th December. We submitted our paper "Lost in Migration: Attributing carbon to cloud" and the sector was well represented in the discussions. The more outlandish proposals were dropped, leaving a priority list of about half a dozen. We should see final proposals early in 2020.



Customer demand for carbon data associated with outsourced digital services is growing. Our *Lost in Migration* paper (see above) proved timely although it was tricky to produce something that was useful without being over-complicated. The objectives were to start the conversations that need to happen between operators and customers, inform outsourcing decisions and facilitate Scope 3 reporting. A workshop is scheduled for January 2020 to present the paper and discuss broader issues relating to the sustainability of cloud services.

6 Tussles with Brussels

EU ETS: EU Emissions Trading Scheme

in 2018, after years of lobbying, we got the welcome news that Phase IV includes a provision, Article 27a, for member states to exempt ultra-low emitters (below 2,500 tonnes CO_2/year). So in 2019 we focused on ensuring that UK government implemented it, in a robust but pragmatic way. This was anything but straightforward, with plenty of hoops to jump through (three years of verified data are needed to prove that installations, er, do not need to be verified(!). This and other requirements presented obvious difficulties to new sites but in the end, with help from BEIS, all eligible sites appear to have been included on the list submitted to Brussels for exemption. Now we wait and see. BEIS has also set out multiple options for a post-Brexit ETS equivalent – depending on whether we leave with or without a deal, so we have all had a lot on our plates. We held a productive site meeting with BEIS in February, kindly hosted by Interxion, which was helpful in building awareness of the characteristics of these installations followed by a low emitters workshop with BEIS on 21st June. We produced a heads-up for operators that included guidance on the NIMS data gathering process, and made good use of previous outputs like Emergency Generation in Data Centres, a Council Communication on ETS and our guide to calculating carbon emissions from generators

Lot9: Legislation by guesswork?

Lot9 warfare has continued to rumble on, with industry experts identifying shortcomings in Commission documentation including technical issues in the guidance. There are also concerns that setting criteria too narrowly will result in compliant devices being deemed unacceptable. The technical detail is fiendishly complex and DIGITALEUROPE continues to lead the dialogue. In the meantime we tried to make sense of the issue by comparing server configurations to beetle diversity, but without much success. We expect to see the legislation come into force in 2020 with implications for server manufacturers and data centre operators, especially enterprise and cloud providers. We remain concerned that policy is being developed based on ideology rather than evidence by people who don't necessarily have the requisite technical understanding. Plus ça change.

Green Public Procurement for Data Centres (GPP)

The Commission is keen to ensure that public authorities make sustainable choices when procuring data centre services, but this is easier said than done: buying the most energy efficient kit does not guarantee an efficient operation because data centres are complex and require a systems approach that includes qualitative considerations like right-sizing. We were engaged in the process from the start, submitted input and attended stakeholder workshops. Final draft proposals were published here at the end of 2018 and we responded in January 2019. Most of our major concerns had been addressed. We still took issue with the reference data and some definitions but there was little to die in a ditch over. We have volunteered to help draft the guidance as this will be important in ensuring the criteria are applied correctly. However, things have gone quiet, perhaps due to changes in the Commission and Parliament. We nudged before Christmas and were informed that work would start shortly, so look out for developments in 2020. Meanwhile other documents relevant to this issue include our note on pros and cons of performance metrics, our formal response to the initial proposals, our input to the second draft and our comments on the final draft at the end of 2018. In general it has been a productive dialogue.

7 Platforms and Press

Platforms (Events)

We spoke at around 20 events this year. Highlights included DataCentreWorld in March, where we talked about compliance, GDPR and Brexit, a trip to Lulea to speak about the history of data centres at the 100th Anniversary of the Swedish Academy of Engineering Sciences, and back to London for DCD in November where we launched our Sector Energy Routemap. We spoke at industry events in Manchester, Dublin and Birmingham, internal seminars and external stakeholder briefings.

Press Coverage

2019 was a good year for press coverage, with plenty of published articles, including pieces for Friends of Europe, Data Economy, Data Centre Dynamics, Computer Weekly, Business Green, Inside Networks, IET and others. We were interviewed by the BBC on digital infrastructure in Wales and by DCD on our Energy Routemap.

- Guardian: GCHQ operating without a permit
- Inside Networks: 5G and Data Centres and Data Centres and Power
- Techerati: Data Centres and Brexit
- Data Economy: 5G: Not Just 4G on Steroids and Ten Myths About Data Centres
- Data Economy/ Wired: Datacloud Awards: Impressing the Judges
- Inside Networks: Human Error?
- Friends of Europe: Data Centres and Climate Change
- BBC: Wales Digital Powerhouse
- Data Economy: Extinction Rebellion Threatens data centres
- Business Green: How data centres can contribute to net zero
- DCD: Energy routemap launch
- Computer Weekly: DCs to scale up climate change effort
- IET supplement: Skills also Policy and regulation and Attributing carbon to cloud
- Data Economy: Attributing Carbon to Cloud
- DCD: Digital Growth needs green investment
- Business Green: Attributing Carbon to Cloud
- DCD: Cogitating on the New Commission College

8 Governance, Further information and Contacts

We held five Data Centres Council meetings in 2019 to review programme activity and set priorities. Council ToR, member bios, application criteria and formal Communications are available from the Council pages of our website. Notes and papers are available for all Council meetings on request.

Further Information

Previous activity digests can be found here, including 2019 Q1 and 2019 Q2. There was no Q3 for 2019 as Emma had to throttle back for a bit after falling out of a tree and fracturing her spine. For those who want to go back further there is our 2018 overview plus the quarterly reviews: 2018 Q3, 2018 Q2, 2018 Q1, the 2017 programme overview and those for 2016, and before. We don't do a Q4 for any year – we always roll that into the annual overview.

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