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Does streaming really have a dirty secret?

A review of the recent BBC3 piece: *Dirty Streaming: The Internet's Big Secret.*

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BBC Three recently streamed a piece on the physical infrastructure that enables us to access video content on demand, emphasising growth in energy consumption and reliance on fossil fuels.

While we agree that it is important to keep a close eye on any potential negative consequences associated with the growth in the use digital services, this must be based on rigorous analysis, sound policy and informed citizens. It is therefore disappointing that a number of the claims made by the programme were misleading, or simply incorrect. This paper seeks to correct those claims.

It is certainly true that we need to become more responsible digital citizens, and the programme had a valid purpose in helping people understand how the internet works: Not everyone knows that our digital society is enabled by physical infrastructure and that this has an energy and carbon impact beyond our own devices. Moreover, as we have stated publicly, the freemium and advertorial business models that are so popular at the moment send no signal to the consumer of the energy cost of their online activity.

We would have liked to see reference to peer-reviewed reports and industry data instead of alarmist claims and analogies that don't bear too much close scrutiny. We also wondered about the choice of a streamed medium – BBC iplayer, for a programme about the negative impacts of streaming. And we wondered why the producers felt it necessary to fly a film crew to the USA when we have a world class data centre sector here in London, which they are welcome to visit whenever they like.

"There are hundreds of thousands of data centres like the large operations pictured." Yes, there are thousands of data centres, perhaps tens of thousands but to reach a total in the hundreds of thousands you would have to include things that are not data centres at all: you would have to count individual servers in offices, and those in server rooms, closets and comms rooms. In the UK, a highly digital economy, there are between 400 and 450 recognisable facilities.

"Data centres do nothing except allow us to upload videos of cats." Data centres underpin the economy. See our ten myths about data centres:
https://www.techuk.org/insights/news/item/15255-ten-myths-about-data-centres

"Data centre energy is spiralling out of control." There is plenty of evidence to the contrary, most recently from Lawrence Berkeley Labs in the February edition of Science:
https://science.sciencemag.org/content/367/6481/984
At a UK level our energy data from the climate change agreement shows an incremental increase in energy consumption from 2.57 TWh to 2.89TWh between 2016 and 2018. Infrastructure efficiency has improved by 16% since 2014. At the same time improvements in hardware, in software and in utilisation have massively increased productivity. The energy needed to process a given amount of data has reduced by around 7 orders of magnitude over the last three decades.

"The ICT sector uses the same energy as the airline industry." This dates from 2007 when Gartner wanted to make the point that ICT was a significant energy consumer. However, there were issues with the figures then and also with the methodology. It does not account for the fact that airlines emit scope 1 and ICT scope 2, or that ICT is a much larger sector (so it is a bit like saying an elephant and a goat produce the same amount of manure and that therefore we need to do something about

the elephant). No account is given for the sector's ability to deliver emissions reductions elsewhere or that ICT is decarbonising through renewable energy procurement – a much harder call for airlines. It also ignores radiative forcing which increases the impact of emissions from airlines.

"Streaming a video equates to 40g of carbon" and "**watching this documentary is the same as driving 235m in a car."** Both of these are wrong. The Carbon Brief analysis explains why. https://www.carbonbrief.org/factcheck-what-is-the-carbon-footprint-of-streaming-video-on-netflix

"Streaming of Deperactio uses the same energy as the annual consumption of African countries." This is incorrect, like a previous claim about Gangnam Style and the energy consumption of Burundi. Ericsson has demolished the former: "*The "Despacito" example "Five billion downloads and streams clocked up by the song, Despacito (released in 2017), consumed as much electricity as Chad, Guinea-Bissau, Somalia, Sierra Leone and the Central African Republic put together in a single year." This was a statement made in several media articles around spring 2018. The electricity consumption of the above countries was about 1TWh in 2017 (1TWh = 1 billion kWh). In comparison, let us look at YouTube, which contributes towards Google's overall electricity consumption, being about 7.6TWh in 2017. It cannot be true that one song, even if streamed billions of times, consumes as much as one-seventh of Google's electricity usage. More accurately, 5 billion downloads of this song to a smartphone requires about 0.005TWh (a factor 200 less) including its share of networks and data centers. Typically, a download of one song requires 0.001kWh."*

"Growth of data results in a parallel growth in data centre energy consumption." Wrong: this is an old chestnut. Multiple predictions of this type have been discredited simply by time, because they did not come true. Simplistically, Moore's Law, which means that the energy needed to process a given amount of data halves about every 18 months, together with technological developments such as virtualisation and infrastructure improvements have enabled the sector to meet an explosion in demand for digital data with only an incremental increase in energy. There are multiple evidence-based, peer-reviewed studies to back this up, the latest of which is from Lawrence Berkeley: https://science.sciencemag.org/content/367/6481/984

"Data centres are all buying dirty power." 76.5% of the electricity purchased by UK commercial data centre operators is 100% certified renewable, and a further 10% is purchased according to customer requirement which increasingly means renewable, taking that total up above 85%. Google is the world's largest purchaser of renewable power, meeting its requirements through power purchase agreements; direct contracts with renewable generators that create additional utility scale renewable capacity. Operators are increasingly adopting this form of power procurement. This is spelt out in more detail in our sector energy routemap: https://www.techuk.org/insights/reports/item/16263-data-centre-energy-routemap

"Data centre power consumption is a dirty secret" It is not. In fact, consolidating IT activity into purpose-built facilities improves both transparency and efficiency. Enterprise operators report corporate energy and carbon through mandatory and voluntary regimes. The UK commercial sector monitors and reports its energy consumption at sector level. Commercial operators here currently consume around 3TWh of power a year, just under 1% of electricity production. Energy consumption is measured, audited and publicly reported at regular intervals in our CCA reports: https://www.techuk.org/images/CCA_First_Target_Report_final.pdf and https://www.techuk.org/images/CCA_Second_Target_Report_04.pdf

"5G will stimulate an explosion in energy demand" While 5G will enable the internet of things and this will have an infrastructure requirement in the form of Edge data centres, it will not be an explosion. Although there will be an energy requirement, 5G is significantly more energy efficient than 4G, which was itself more efficient than previous generations. The business case for 5G applications like M2M, IoT, autonomous vehicles will depend on the transactions and activities being

performed very efficiently. There is also scope for 5G to deliver economy wide efficiencies – reducing congestion through real time traffic management, for example.

In conclusion…

All this is not new: Back in 2013 the New York Times ran an article about the negative impact of data centres and we rebutted that point by point in a similar way in Data Centres and Power: Fact and Fiction. What disappoints us is that although the industry has made huge strides, the tone of reporting has not. We would have liked to see reference to industry data and evidence-based, peer-reviewed studies instead of repeated reference to high profile but unsubstantiated claims. It's also a shame that a worthwhile and useful attempt to understand a sector we all rely on so heavily presented it in such an alarmist and misleading way.

Sources:

IEA report: Digitalisation and Energy which explains the trade off between ICT and broader energy savings: https://www.iea.org/reports/digitalisation-and-energy
Carbon brief on impact of video streaming: https://www.carbonbrief.org/factcheck-what-is-the-carbon-footprint-of-streaming-video-on-netflix
Ten Myths about data centres: https://www.techuk.org/insights/news/item/15255-ten-myths-about-data-centres
Our energy routemap: https://www.techuk.org/insights/reports/item/16263-data-centre-energy-routemap
CCA reports 1 and 2 https://www.techuk.org/images/CCA_First_Target_Report_final.pdf and https://www.techuk.org/images/CCA_Second_Target_Report_04.pdf
Data Centres and Power: fact or fiction: https://www.techuk.org/insights/reports/item/275-data-centres-and-power-fact-or-fiction

Postscript! We have since published an analysis of the reasons why energy use in data centres tends to be exaggerated. See The Viking Helmet

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- For more on our data centre programme see: techUK data centre programme: https://www.techuk.org/focus/programmes/data-centres
- Data centre programme overviews, 2019 overview and 2020 Q1 overview

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Emma Fryer, March 2020