YOUR CO-OP
BROADBAND

BACKING DOCUMENTS

CARBON ANALYSIS

Purpose: A breakdown of the 2020 customer data to provide a calculation of the carbon impact of our broadband and Fibre services we provide to our customers. These backing calculations can be used to determine the required value of offsetting in order to make our services Climate Positive and support a more sustainable practice of working.

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VERSION HISTORY

Version #	Implemented By	Revision Date	Approved By	Approval Date	Reason of change
1.0	*Chris Horne*	*13/05/2021*	*Dennis Hettema*	*28/05/2021*	*Initial copy*

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1   WHAT BASE CALCULATIONS ARE USED?

In an article published in 2020 by George Kamiya [1], a digital/energy analyst at the International Energy Agency (IAE) it is estimated 0.06 kWh is required per GB of data Transmitted across the internet.

Using this figure, the next step used is to estimate how much CO2 is created per kWh. According to UK government figures published in 2020 [2], the amount of CO2 created per kWh is 0.23 kg. Thus: 0.23*0.06 = 0.0138 kg of CO2 for every GB streamed/transmitted.

1.1   ANALYSIS OF 2020 BASE USAGE DATA BY SUPPLIER

This is a break down of usage by individual supplier base which calculates the total data usage for 2020. This is then averaged across the number of customers to create a monthly figure that can be calculated for CO2 impact. For any suppliers where 12-month usage data is not possible, for example where no connections were active then averages will be calculated for periods in which data is available. [3]

1.1.1   SUPPLIER BASE 1

Unique users - 591
Total usage (MB) – 388,323,255.00
Total usage (GB) – 379,221.93
Year average per user (GB) - 641.66
Monthly average per user (GB) - 53.47

kg Carbon per user, per month (@0.0138 per GB) - 0.74

1.1.2   SUPPLIER BASE 2

Unique users – 987
Total usage (MB) – 1,010,880,204.80
Total usage (GB) – 987,187.70
Year average per user (GB) – 1,000.19
Monthly average per user (GB) – 83.35

kg Carbon per user, per month (@0.0138 per GB) - 1.15

1.1.3   SUPPLIER BASE 3

Unique users – 13,505
Total usage (MB) – 20,328,683,733.00
Total usage (GB) – 19,852,230.21
Year average per user (GB) – 1,469.99
Monthly average per user (GB) – 122.50

kg Carbon per user, per month (@0.0138 per GB) – 1.69

1.1.4 SUPPLIER BASE 4

Unique users – 1413
Total usage (MB) – 1,008,791,992.32
Total usage (GB) – 985,148.43
Year average per user (GB) – 697.20
Monthly average per user (GB) – 58.10

kg Carbon per user, per month (@0.0138 per GB) – 0.80

2 EQUIPTMENT

2.1 INTERNAL SERVERS

As well as the previous calculations for the national infrastructure used to deliver the service, we also have to consider the servers we use to manage the billing and support of the products. Although these are not dedicated solely for the provision of our Broadband and Fibre products this calculation will include their full footprint in order to maximise the offsetting value.

Our servers are located in a shared Data Centre and although our offices are powered by green energy, for the purposes of this analysis we will be assuming this is not the case for the server location.

A typical on premise or data centre-server using non-green electricity produces 916 kg CO_2e per year [4] We currently operate 3 application servers within our cluster so annually these would produce an average 2,748 kg (2.75 tonnes) of CO_2e or 229 kg per month. If we then average this across the total base of customers (229 kg/16,496) we get **0.014 kg per month**.

2.2 CUSTOMER ROUTERS

Each individual user would require a router to deliver their service and as such, even if not supplied by us we will include the energy consumption of these units as part of the end to end delivery.

Wireless routers provide internet or network access, they are very popular for home networks allowing users to share a connection across multiple devices and computers. Wi-Fi routers are typically solid-state devices and do not have moving parts, as a result their energy consumption is very low and they are usually left on 24 hours a day to provide uninterrupted internet access. It is estimated that a Wi-Fi router uses 2 to 20 watts, with 6 watts being average for a wireless router. [5]

This means each router would consume 0.14kWh per day or 51.1kWh per year, based on the previous carbon calculations this would be 11.753 kg of CO_2 per year or **0.98 kg per month**.

3 ENGINEER RESOURCE

All new internet connections require some degree of engineering work from the infrastructure provider (Openreach) and as such it is a consideration to include some additional offsetting for the engineer miles required to visit an exchange or premise to activate our services.

With more than 27,000 commercial vehicles, Openreach operates the second largest van fleet in the UK and last year their engineers travelled over 220m miles – using more than 37m litres of fuel and producing over 95,000 tonnes of CO_2. This is for their total 2020 mileage and so is for all customers they service totalling 9.9m engineer visits. [6]

In numerical terms our impact contribution would be calculated as follows:

95,000,000 kg (CO2) / 220,000,000 miles = 0.432 kg per mile
220,000,000 miles / 9,900,000 visits = 22.22 miles per visit

22.22 x 0.432 = 9.6 kg of CO2 per visit

Engineer related visits for 2020 = 2623[7]

Total engineer Carbon 2623 x 9.6 kg = 25,180.80 kg (25.18 tonnes)

Averaged across total unique users: 25,180.80 / 16,496.00 per year

1.53/12 = 0.13 kg per month

4   CONSOLIDATED MONTHLY IMPACT REPORT

Total unique users – 16,496.00
Total usage (MB) – 22,736,679,185.12
Total usage (GB) – 22,203,788.27
Year average per user (GB) – 1,346.01
Monthly average per user (GB) – 112.17
Total number of routers – 16,496.00

Average kg Carbon per user, per month (@0.0138 per GB) – 1.55 kg

Average kg Carbon for internal servers, per month – 0.014 kg

Average kg Carbon per router, per month – 0.98 kg

Average kg Carbon for engineer resource, per month – 0.13 kg

TOTAL CO2 (kg) per service user – 2.674 kg

5   OFFSETTING DETAILS

In order to offset the carbon produced by our broadband and Fibre products we have partnered with Ecologi who provide 2 solutions for us.

1. **Direct Carbon Offsetting:** Each month we fund the offsetting of 50 kg of Carbon per new customer, Ecologi then invest that money into projects that remove more greenhouse gasses than our own carbon footprint puts in.
Each month they support a range of carbon reduction projects that are certified at the very highest level by Gold Standard and equivalent.

2. **Tree planting:** It's now common knowledge that one of the best tools to tackle the climate crisis and keep our temperatures from rising above 1.5C is to plant trees. They are also crucial to preventing ecological collapse.
We also fund the planting of a new tree for each customer, every month they use our Climate Positive Broadband service via Ecologi's tree planting partner, Eden Reforestation Projects. Through this they plant millions of trees around the world each month.

What does 5kg of CO2e look like?

It may be hard to visualise what this impact is, so some good examples are:

1. Taking the tube all the way around the London Circle line 67 times

According to Wikipedia [8] the circle line is 27 km all the way round and using the government greenhouse gas conversion figures [2] the average CO2e footprint of a tube traveller is 0.0275kg per km

2. Taking a train from London to Manchester and back 3 times

Google maps shows the distance between London and Manchester as around 209 miles and using the government greenhouse gas conversion figures [2] the average CO2e footprint of a train traveller is 0.03694 kg per km

3. Leaving your Smart TV on for 6 months

An average Smart TV uses 36 kWh per month [9] and using the previous kWh value of 0.23kg this calculates to 8.28kg per month (50kg / 8.28 = 6.039 months)

5.1 MAKING A POSITIVE IMPACT

Based on our analysis above of we have estimated that our average broadband service produces 2.674 kg per month to provide and maintain, however we believe that we should go beyond just being neutral and as such we choose to maintain our value of **50 kg per customer per month** as well as planting **a new tree for every month** our customers stay with us giving a long term gain as well as a more immediate solution to slow down the increasing growth of greenhouse gases.

Fig 1. Split of the monthly carbon offset allowance
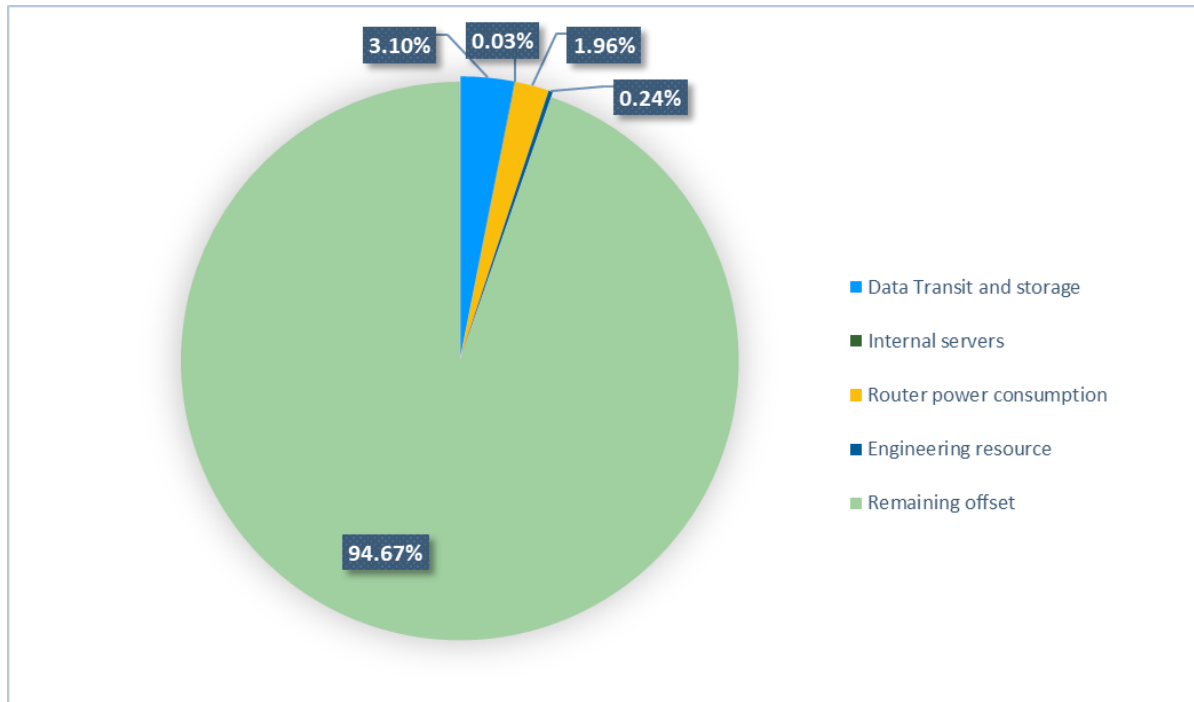
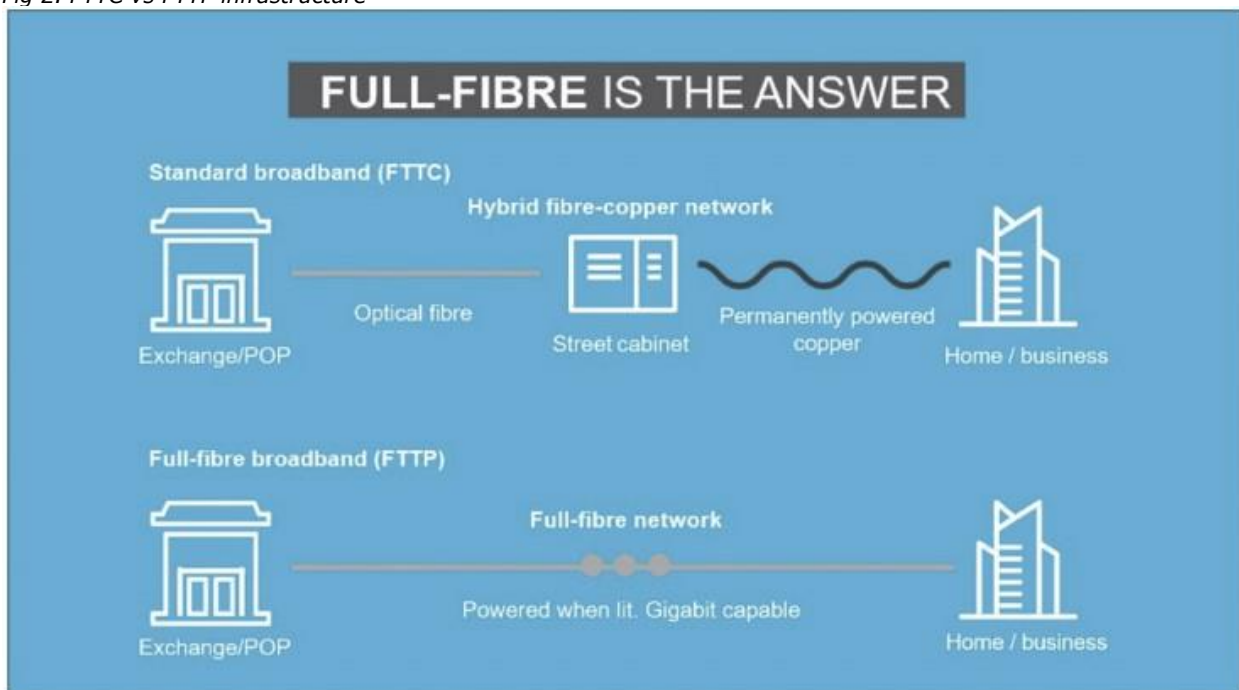There are also other ways we look at how we can improve our ways of working

5.1.1 SUPPLY CHAIN

We actively look to work with like-minded partners where possible to provide, not only competitive and exceptional services but also share our ethical practices. This is why our primary Fibre to the Premise provider is a Registered BCORP member and deliver us with Carbon Neutral services which we further offset to make an even bigger impact.

5.1.2 TECHNOLOGY

We are actively engaging with our suppliers and partners to provider greener technology and a big part of this is the adoption of Full Fibre services. Fibre to the Premise (FTTP) uses more energy efficient technology throughout its network and in Europe, the greenhouse gas emissions associated with the FTTP infrastructure are 88 per cent lower per gigabit, compared to other access technologies [10]

Fig 2. FTTC vs FTTP infrastructure [11]

6 SOURCES

1. *https://www.iea.org/commentaries/the-carbon-footprint-of-streaming-video-fact-checking-the-headlines*

2. *https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020*

3. *Data taken directly from supplier usage files and received call data record (CDR) information*

4. *https://www.goclimate.com/blog/the-carbon-footprint-of-servers*

5. *https://energyusecalculator.com/electricity_wifirouter.htm*

6. *Openreach Annual review 2020 (https://www.openreach.com/about-us/our-performance/annual-review-and-reports)*

7. *Data taken from supplier billing files, where historical or archived data was not available an average was taken. Information includes installations, fault related visits and any other events which would have incurred engineer travel.*

8. *https://en.wikipedia.org/wiki/Circle_line_(London_Underground)#:~:text=The%20Circle%20line%20is%2017,km)%20long%20with%2036%20stations.*

9. *https://letsavelectricity.com/how-much-power-does-a-tv-use-in-an-hour/*

10. *Baliga, J., Ayre, R., Hinton, K., & Tucker, R. S. (2011). Energy consumption in wired and wireless access networks. IEEE Communications Magazine, 49(6), 70–77. doi:10.1109/MCOM.2011.5783987*

11. *https://www.cityfibre.com/wp-content/uploads/2018/04/Carbon-Smart-Our-digital-infrastructure-neednt-cost-the-earth-1.pdf*