Virgin Media O2 response to Ofcom's Call for inputs:

Review of the use of fixed wireless links and spectrum implications

Non-confidential version

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INTRODUCTION

Virgin Media O2 ("VMO2") welcomes the opportunity to respond to Ofcom's Call for inputs on Review of the use of fixed wireless links and spectrum implications.[1] Our response focusses on Ofcom's specific questions.

RESPONSE TO SPECIFIC QUESTIONS

Question 1: Please provide a description of your current use of fixed links (or indicate which of the use types in Table 3.1 best describe your use type).

Mobile network operator (MNO). **[✂]**

Question 2: What are the factors driving your choice of fixed links over alternative connectivity solutions, and which factors have the biggest impact on your decisions? Is this likely to change in the next 5 years? If so, what do you expect will change?

In relation to new connections, main drivers are optical fibre availability, delivery timescales and cost.

Optical fibre is the preferred medium, however there are some circumstances where it is not feasible and fixed wireless becomes a consideration. These circumstances are as follows:

i) No network available from backhaul supplier;

Provision of network is technically not feasible due to wayleave or distance limitations. In this case, fixed wireless access will be considered as a means of connection.

ii) New network backhaul supplier not financially feasible;

There are considerations which contribute to financial feasibility or TCO (Total Cost of Ownership) of a new fibre connection, these are;

1. fixed ancillary one-time costs/connection/wayleave fee, typically to extend providers infrastructure to the required location.
2. circuit rental cost, an annual recurring cost of the service.

For a proposed connection, these costs will be used to build a TCO for that connection over a specified time period. If the connection is beyond the acceptable range, it will be considered for an alternative transmission solution, such as fixed wireless access.

iii) New network backhaul supplier timescales

[1] https://www.ofcom.org.uk/__data/assets/pdf_file/0019/270190/Call-for-input-Review-of-fixed-wireless-links-and-spectrum-implications.pdf

Procurement of optical fibre can be a lengthy process; particularly where significant network build or wayleaves are required.

In the event that provision of fibre optic backhaul connection is not consistent with network delivery expectations, it might be necessary to consider a fixed wireless connection as an alternative mechanism either as a permanent solution, or as a temporary solution in lieu of the optical fibre.

iv) Temporary connections

When a temporary solution is needed at a site for fixed period of time (sometimes days or weeks), often fixed wireless access is preferred due to the following considerations;

1) difficulty to justify a fibre optic TCO, particularly where there are high fixed ancillary costs.
2) Temporary site deployment is often with very limited notice; it is very difficult to deliver fixed infrastructure such as fibre optic ducted network without many months of prior notice. In this case Fixed wireless solution is often preferred for temporary deployments.

In the next 5 years, we expect to see a stronger drive towards more optical fibre and less fixed wireless, particularly where 5G access spectrum and possible RAN evolution towards fronthaul and midhaul concept demands 10 Gbps, these will likely be in the dense urban areas. In suburban and rural areas, we expect the above considerations to remain valid.

Question 3: Is the current spectrum available for fixed links in the UK suitable and sufficient for your needs? If not, what would you change and why? If you believe changes are required, please give specific examples and reasons along with supporting evidence if available.

General vacation of link volumes in most conventional bands since 2016 has to an extent counter-balanced the need for more bandwidth on remaining fixed links. We would expect this trend to continue.

Current spectrum available for fixed links appears to be sufficient for our needs, however it must be noted that it is likely that the trend towards wider channel bandwidths across all carrier bands is not expected to cease.

There will be increased focus on 70/80 GHz band in the coming months and years, some rejections have been experienced and we expect this to be an increasingly common occurrence in the future, it would therefore be sensible to monitor this going forwards. In the same way that traditional microwave band licences have increased in bandwidth, we can expect the same for 70/80 GHz e.g. Today typically 250MHz/500MHz, in the future 750MHz/1000MHz is likely to be more common, given the regulated band is limited to 2000MHz, this could become congested in some high demand areas.

Question 4: Is there anything about Ofcom's current framework for authorising fixed links which you consider could be improved?

We have adopted the Batch application system (leaving aside the individual applications) and we are happy with the speed/volumes of the licensing process. We are in constant communication with Ofcom's Spectrum Licensing team.

Question 5: How has your use of fixed links changed between 2016 and now? Please provide information on:

- Reasons for increase or decrease in the number of your links since 2016;
- Changes in the capacity of your links since 2016, including how you have; delivered this capacity change, e.g., different channel bandwidths, different link technology (please specify), etc.

Volume of links since 2016

[✂]

[✂]

Since 2016 the total volume of fixed wireless links has grown. **[✂]**

As the network evolves in some high demand areas such as urban areas, we will expect that the fixed wireless access solution will not scale and therefore will need to be replaced with fibre optic (likely 10Gbps).

Change in capacity since 2016

Capacity of links since 2016 has shown significant increase, this has been realised by the following mechanisms;

-***Move to wider channel bandwidths including 112MHz e.g.***

[✂]

[✂]

[✂]

-***increase in CCDP 2+0 with xpic function***

[✂]

-**Adoption of E-Band**

[✂]

-**Increase QAM.**

As microwave hardware becomes more advanced it has been possible to increase the upper QAM level **[✂]**

Question 6: How do you expect your usage to change over the next 5-10 years? Please provide information on:
- any increase/decrease in the number of links (by band) and bandwidth expected;
- likely changes in geographic distribution of links;
- likely changes in distribution of links by frequency band;
- likely changes in capacity of links and how you expect to deliver this capacity;
- other changes not covered above.

Overall, we would expect a decrease in the total number of links across all bands driven by a reduction in the number of links in dense urban areas.

Any reduction of band in urban environment will be offset by more E-Band in suburban and rural settings, therefore overall we expect to see increase of E-Band link volume.

38 GHz and 80 GHz propagation is similar, therefore as 38 GHz links become saturated, we expect that they will be upgraded to E-Band.

- likely changes in geographic distribution of links;

Fixed link use will become more polarised towards suburban and rural settings i.e., reduced volume of fixed link use in urban areas. This is not to say that there will be an increase in the number of fixed links in the sub-urban / rural areas, those that are there today will largely remain whilst in the urban areas fixed links will be replaced by optical fibre in the coming years.

[✂]

- likely changes in distribution of links by frequency band;

We expect a reduction of 38 GHz.
Increase of E-Band
Increase use of our licensed 28 GHz block, where applicable.

- likely changes in capacity of links and how you expect to deliver this capacity;

There will be demand for link capacity of 1Gbps or above as mobile cell sites are upgraded to 5G and more access spectrum becomes available driving backhaul demand. In order to realise this bandwidth, microwave links will become predominantly 56MHz or 112MHz using 2+0 CCDP.

We also envisage increasing use of bandwidth carrier aggregation (BCA), for medium distance links BCA 18/23/28 GHz + 80 GHz, for longer links we may BCA 15/18 + 28 GHz.

- other changes not covered above.

Dual transceiver hardware will make 4+0 (2 x CCDP) a much more achievable and realistic hardware footprint on sites, **[✂]** Currently we support 2+0 only.

Question 7: Which of the developments listed above are expected to have the biggest impact on your use of fixed links? Are there other developments to be aware of that have not been listed? Please explain the reasons for your answer.

5G RAN developments, increased access spectrum and possible centralisation of function will be a challenge for fixed wireless access. Currently, it is not clear exactly how this principle will be delivered in terms of x-haul, and how x-haul could work with MW ACM or not. **[✂]**

Centralisation is only likely to happen in urban areas initially and our response here is consistent with earlier questions which predict a reduction in fixed links in the urban setting.

Question 7a: Are you considering using NGSO satellites to provide backhaul for your network? If so, please provides details of the capacity requirements/expectations and the locations where delivery of this type of backhaul would be likely.

[✂] Initial view is that the use of NGSO (LEO) satellite will not meet bandwidth or network performance requirements to be a viable alternative to conventional backhaul solutions. **[✂]**

Question 8: If you already use alternative transport options for delivering your services, please:

- Provide an indication of the proportion of your services delivered over fixed links vs each alternative that you currently use. Is this proportion likely to change over the next 5-10 years? Is so please provide details;
- Explain how your business rationale for use of fixed links vs alternative connectivity solutions is changing over time;
- If possible, provide examples of your decision-making process for recently deployed connections.

[✂]

[✂]

Question 9: Which of the listed technologies are you already using or do you plan to use in the future? For each that you are using/plan to use, please explain:

- the current extent of your use, whether you expect to expand or shrink your use over the next 5-10 years, and how availability of these capabilities might impact your choice to deploy fixed links vs an alternative.

Estimates of numbers or percentage of links deployed with each capability now and in the future would be valuable. We are particularly interested in feedback on future use of BCA.

[✂]

[✂]

[✂]

[✂]

[✂]

Question 9a: If you plan to use BCA would you plan to use this primarily for new links, upgrades to existing links or a mix? What factors affect your decision to deploy (or not deploy) BCA today? Please provide whatever detail you can.

[✂]

Question 10: Do you have a need for W and D bands for fixed links use (or alternative uses)? If so, in what timescale?

Please provide further details, including any evidence you have to support your response.

No current demand or use case is evident, added to that vendors hardware is not available, nor licencing regime. We track evolution of the 5G landscape. If there is a use case, it may be 5-10 years away.

Question 11: Do you expect to apply for new fixed links in the upper 6 GHz band in the future, and if so, in which geographical areas? What are the reasons for choosing this band over other available bands or alternative technologies? Is there a technical reason why you would choose the upper 6 GHz band?

No. We do not plan use the upper 6 GHz band for new fixed links.

Question 12: Are there other international developments that you are aware of that could affect availability and utility of fixed links in the next 5-10 years?

We are not aware of any.