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Issue 1

BT's response to Ofcom's call for input:

Spectrum Review

A review of the management of the spectrum currently used for Point to point fixed links and other services that share this spectrum

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BT's response to Ofcom's Call for Input on: "Spectrum Review"

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Executive Summary

1. BT welcomes Ofcom's review of fixed links spectrum and is pleased to contribute its views and ideas to this call for input. The related review of spectrum pricing that Ofcom has committed to undertake is also welcomed. We are of the view that it is appropriate to reduce annual spectrum charges and that this is possible without compromising Ofcom's spectrum management objectives. This would promote greater and efficient use of spectrum, particularly in rural geographic areas where spectrum congestion is not an issue.

2. Given the increasingly wide availability of fibre based solutions and the substantial amount of new spectrum that Ofcom released to the market in its 2008 auction, we predict that additional demand for fixed links spectrum managed by Ofcom for new uses, such as 4G mobile backhaul and broadband backhaul, could be less than Ofcom may anticipate.

3. The existing licence products and management regime, whereby Ofcom centrally manages fixed links bands buthas also made some auction spectrum available for self-management, works well for BT and we do not see a need to change this balance at this time.

4. We would welcome further development of Ofcom's centralised spectrum management processes with additional features that would enable operators to explore the feasibility of new assignments online, and for Ofcom to work to reduce licensing timescales where possible.

5. We do not see evidence that projected demand for satellite systems cannot be accommodated within existing bands by planned systems. We do not advocate changes to the sharing arrangements in the 18GHz band or other bands.

BT's response to Ofcom's Call for Input on: "Spectrum Review"

1 Introduction

BT is pleased to submit this contribution to Ofcom's call for input on its Spectrum Review and welcomes the fact that Ofcom is undertaking this activity at this time, alongside the related review of spectrum fees that Ofcom has committed to undertake.

BT is one of the largest users of fixed links spectrum with many thousands of fixed links in operation across a number of different frequency bands, most notably the 6GHz, 18GHz and 38GHz bands managed by Ofcom and within the 32GHz band where BT acquired spectrum in the 2008 auction. We therefore have a significant interest in the review that Ofcom is undertaking and will assist in achieving an outcome that will ensure that the fixed links spectrum bands remain efficiently used and managed and that BT's continuing requirements to access this spectrum to the benefit of customers is safeguarded.

In section 2 we provide an overview of BT's position on the matters raised within Ofcom's call for input and in section 3 we answer the specific questions that Ofcom has posed.

2 Overview of BT views

BT's use of fixed links spectrum has changed over the past decade. We have cleared our 2GHz links to make way for mobile and mobile satellite services; removed our core transmission networks that operated in the 4GHz and 11GHz bands; concentrated our core network radio systems in remote areas using the L6GHz and U6GHz bands and have maintained (but slightly reduced) our extensive use of the 18/38GHz bands for access radio systems. We increasingly use the 32GHz self-managed spectrum that we obtained at auction in 2008 in preference to Ofcom managed bands.

We are concerned that the annual spectrum charges for Ofcom managed spectrum are out of line with the market value of similar spectrum as revealed by the 2008 auction and have asked that these are reviewed. We also consider that spectrum charges are inappropriately high in rural areas where there is less demand and where, viewed across the available bands, there is little risk of congestion. The level of fees is affecting decisions around which bands to use and whether wireless can be used at all, without an obvious benefit in terms of promoting efficient use of the spectrum. Indeed the experience of the 4GHz and 11GHz bands has shown that high spectrum fees can lead to less efficient spectrum use since link numbers have fallen substantially.

Apart from concerns over the level of spectrum fees, the current combination of Ofcom managed bands and self-managed auction spectrum works quite well and we are not seeking any fundamental change to this regime. Ofcom appears to manage the fixed links spectrum well and it is unclear that outsourcing this management function, or selling the spectrum to parties to acquire for their own use (with incumbent use continuing or simply to manage and sell access to others) will lead to lower spectrum management costs or more efficient use of spectrum. Once annual fees better reflect market value it may be possible to consider auctioning spectrum with incumbent use, but we see little benefit in such auctions and would suggest that Ofcom focusses on unused or lightly used spectrum if auctions are contemplated (as was successfully done in 2008 when the 10, 28, 32 and

40GHz bands were awarded). We would rather that Ofcom built on the current centralised Ofcom management arrangements and enhanced these to reduce licensing turnaround times and developed new functionality, such as enabling online rapid batch coordination of example network proposals to enable the feasibility of link deployments to be assessed ahead of submitting formal piecemeal link requests.

The shared use of fixed links spectrum by other services under present arrangements also appears to be sufficient in BT's view. In particular we are unconvinced that there is credible evidence to suggest that the arrangements for shared use by satellite systems of the 18GHz band need be reviewed or changed.

3 Answers to the consultation questions

Question 1

What are likely to be the key underlying factors influencing changes in demand for thisspectrum (in terms of quantity of spectrum or preferred bands) over the next 5 to 10 years? Please provide band specific evidence to support your view.

The level of spectrum fees will impact demand for the fixed links spectrum that Ofcom manages. The present levels of annual fees seem very high compared with the value of similar spectrum revealed in the 2008 auction, even allowing for Ofcom's costs of managing the licensing process. The effect of high fees is that, where possible,operators will prefer to use spectrum not managed by Ofcom or to use other technologies e.g. fibre. In some cases, for example remote geographic areas, high spectrum costs might even affect the achievement of Government policies such as the availability and affordability of broadband.

The figures provided in Ofcom's consultants' report published alongside the call for input illustrate a substantial decline in the numbers of fixed links across many Ofcom managed bands. This provides evidence to support the points made above, and is mirrored by BT's own experience in terms of our licenced links.

The roll-out of 4G mobile base stations, upgrade of capacity of existing sites and the Government's Mobile Infrastructure Programme may generate some additional demand on fixed links spectrum, but it seems likely that most of this demand would be met with fibre or with spectrum that is already auctioned.

Broadband network backhaul may require some additional use of fixed links spectrum, but such use is likely to be in the more rural areas where spectrum is generally uncongested.

Question 2

Will the reducing trend in the numbers of fixed links in the spectrum under review to support mobile backhaul continue? If so, in which bands will this reduction be most apparent and how will link capacity/bandwidth requirements change? What factors will have the biggest influence on the outcome? In your view, what will be the impact, on spectrum demand, of deploying next generation mobile networks for example using Long Term Evolution (LTE) standards?

BT expects to reduce link numbers in the 38GHz band in favour of 32GHz spectrum. Our use of 18GHz is declining in terms of link numbers, although new provision tends to be for higher capacity links compared to the average of the existing links. Overall we would predict that LTE roll-out will have only a small impact on demand for the Ofcom managed bands in view of the availability of fibre solutions and auction spectrum held by the MNOs and backhaul connectivity suppliers such as BT.

One area where Ofcom managed bands could be of interest is for mobile backhaul in urban areas. If Ofcom's link length policy were to be removed, the 4GHz spectrum that is presently very lightly used might become technically attractive for this purpose.

Question 3

How might the changes to current or future public safety networks influence theexisting and future requirement of the spectrum under review for fixed link backhaulfor public safetyapplications over the next 5-10 years? In which spectrum bands isdemand most likely to rise and how much spectrum would be required? Maydemand for bands currently used by public safety applications decrease? Is it likelythat the public safety services may require access to the spectrum under review forother data networks or for alternative uses?

BT has no input on this question.

Question 4

How likely is it that use of CCTV by local authorities will significantly increase overalldemand for fixed link infrastructure spectrum over the next 5 to 10 years? If so, inwhich bands is the additional demand most likely to be required and why? Do youhave any information about the relative costs of wired and wireless CCTV links inurban and rural areas?

Our experience is that local authorities are using licence-exempt spectrum for CCTV applications both in the urban and rural environments. We note the potential congestion issues experienced by CCTV users in an urban environment where the 5.470 – 5.725 GHz band is increasingly used by 802.11a compliant WiFi devices. This can result in poor frame rates and inconsistent service. Greater use is now being made of 5.725- 5.850 GHz devices for point to point services in the urban environment in order to overcome this problem. CCTV is by nature mission critical in terms of delivery of pictures using real time streaming protocols and in terms of the application for which it is being used. Congestion and outages are a major concern in the continued use of licence exempt spectrum for CCTV applications. There is no doubt that CCTV users would like to operate in a licenced radio environment, but the cost sensitive nature of the application together with the high bandwidth requirement and consequent high licence fees generally make CCTV services using licenced

spectrum non-viable when set against other technologies. Our view is that in the rural environment licence exempt spectrum in the 5.8 GHz will remain adequate for the lower density of services expected but that for urban applications solutions using fixed broadband (e.g. ADSL2+ and fibre broadband) will be more suitable.

Question 5

(a) What are the main factors (technical or regulatory) that determine preferences for one band over another for satellite applications? Do these factors vary betweendifferent types of satellite applications (Mobile, Fixed, Broadcasting and Scienceservices)? In which bands will we see the most significant changes in demand in thenext 5 to 10 years, and why?

The choice of frequency band for satellite applications is a mix of the technical characteristics (e.g. propagation/coverage, antenna size/directivity, required bandwidth) and spectrum availability (e.g. orbital slots and spare frequencies). For telecommunications the trend over the last 30 years has been to progressively develop higher frequency bands (initially C-band, then Ku-band followed by Ka band) and to use wider bandwidths and spot beams as well as various orbital schemes.

(b) A number of the frequency bands under review are currently used for satellitePermanent Earth Stations (PESs), for example to feed Direct to Home satellite broadcast services. What are the continued and future spectrum requirements forsatellite PESs (E-s & s-E) likely to be and in which bands? Please provide evidenceto support your views.

Within the UK BT does not foresee significant increase in demand for Permanent Earth Station licences.

(c) During recent years, some commentators have forecast significant demand forspectrum to support satellite consumer terminals. To date this demand has beenslow to materialise. Do you have information which would help inform a more accurate assessment of future demand for spectrum in bands currently shared with fixed links?

BT agrees with the BDUK and BIS/SBSG[1] (with industry and Ofcom endorsement)assessments that the market for satellite broadband in the UK is about 1% of premises. The report prepared for Ofcom in support of this consultation appears to contain significant flaws in its assessment of the potential demand for satellite broadband services and the associated satellite capacity and spectrum. In summary, the report:

- Does not recognise that many (probably most) existing satellite broadband users only exist because the user terminal and installation costs were subsidised by government (not operators as stated in the document);
- Ignores the implication that future take-up is also likely to be highly dependent on government subsidy if it is to materialise (possibly up to £600 per user);

[1] Satellite Broadband Steering Group

- Under states the satellite broadband capacity available to the UK by end 2012 by just under a factor of 3 and ignores the further capacity becoming available by end of 2014;
- Fails to recognise that the BIS/BDUK forecast demand can be met by the capacity that will be available by end of 2012 (with further capacity becoming available by end 2014);
- Uses a single space industry study, using unrealistic market scenarios (not real data), to suggest take-up of 1-5M users (i.e. 4-19% UK penetration!) without any critical analysis;
- Ignores demand forecasts from the two largest European satellite operators (both offering broadband services) that align with the BIS/BDUK demand forecast;
- Uses an arbitrary figure for the growth rate for data throughput per user that is not based on any known trend (e.g. Nielsen's Law), evidence or analysis of end user behaviours, expectations, pricing impact or likely propensity to take such a service.

BT is not aware of any evidence that the future demand for satellite broadband services will be higher than that identified by BIS/SBSG and BDUK. BT also believes that this demand will be met by the satellite capacity that will be available to the UK by end of 2012, with capacity for expansion and/or increased data rates by end of 2014.

In summary, we are of the view that existing satellite systems and spectrum could support the level of demand that is likely to materialize. The existing available exclusive satellite spectrum, supplemented, if necessary in future, with shared use of 18GHz under presently agreed sharing arrangements, will be sufficient for the foreseeable future and no regulatory changes are required to the arrangements for the 17.7 – 19.7 GHz band as set out in the present CEPT ECC Decision.

(d) Are there factors specific to the satellite based communications sector whichmean that it faces particular difficulties evidencing and satisfying demand forspectrum? If so, how might these be overcome?

No, there is no special case that needs to be made for satellite system demand forecasting.

Satellite broadband suffers from four defining characteristics that impact on take-up:

- High user equipment and installation costs. CPE plus installation still costs several hundreds of pounds and is a significant barrier to adoption;
- Low-end service definitions in terms of monthly data caps and data throughput. Typical product performance is far more similar to mobile broadband services than it is to fixed broadband services;
- High retail service cost relative to the performance delivered (in terms of cost per kbit/s throughput, monthly data volumes, support elements such as time to repair);

- Small addressable market means that mainstream ISPs are unlikely to offer services over satellite broadband infrastructure, significantly reducing customer choice(as seen with some small terrestrial fibre network deployments).

Take-up to date appears primarily driven by CPE subsidy. BT believes that it would be inadvisable to reallocate spectrum to a market sector that appears to be dependent on government subsidy to drive take-up. Such subsidy may not be available in all geographies and could be withdrawn at any time. This could leave spectrum underused and possibly sterilised in terms of being unable to support alternative services.

Question 6

What is the likely timetable for rollout of Smart Grids and what impact will thesedevelopments have on demand for spectrum in the bands covered by this review?

BT has no input on this question.

Question 7

What impact will DAB expansion have on demand for the spectrum under review?Are there any other demand drivers that Ofcom should consider in relation tobroadcasting use or services related to broadcasting?

BT has no input to make on this question.

Question 8

a)What is the likely demand for broadband wireless access applications in thespectrum under review and which bands is this likely to specifically impact? Howshould Ofcom consider the demand for backhaul to support such applications and issuch backhaul demand likely to arise in the spectrum under review?

BT is considering the option to use wireless (including licence-exempt use of TV White Space spectrum) for broadband provision in the very small percentage of cases where fibre based solutions may not be appropriate. The bands under review would mainly be of interest for backhaul rather than the final customer connection. It will be important to ensure that spectrum pricing does not unnecessarily impede or preclude the use of fixed links spectrum for backhaul, especially in more rural areas where there is unlikely to be congestion in use of spectrum. The link length policy may be a barrier to use of some bands, e.g. 4GHz and this should be removed if Ofcom wants to encourage greater use of this spectrum.

b) Do you consider that the emergence of rural broadband fixed wireless access willinfluence overall demand for the spectrum under review and to what extent? Whichbands is this likely to impact most?

The demand for backhaul spectrum could be supported in most of the available bands, or bands that have been auctioned. In the rural areas concerned we would not anticipate spectrum shortages and since we have no definite plans for wireless backhaul of wireless broadband, we cannot offer any quantitative projections. We are not aware of a specific band that will be impacted.

Question 9

Do you consider that there will be a material additional demand from the PMSEcommunity for access to the spectrum under review? Which bands under review isthis likely to impact most and to what extent?

No, we are not aware of any new requirements.

Question 10

How might the economics of new fibre provision (with or without reliance onregulatory remedies – whether active or passive), as compared with wirelessprovision of bothterrestrial and satellite based services, impact on the requirements for wireless backhaul? We are interested in the possible impact, in terms of theextent of possible substitution for wireless links and in terms of the nature of wirelesslinks affected (urban v. rural, lower / higher frequency bands).

The choice between use of fibre or microwave for customer circuits is taken on the basis of minimising costs. Where fibre is available it would normally be used in preference to use of radio. The cost of spectrum is part of that decision and hence can distort the choice.

Question 11

What issues relating to spectrum access for different services do you think Ofcomshould review? How might Ofcom start to rely more on commercial decisions whendetermining allocations of spectrum in the bands covered by this review?

Ofcom should base its decisions on clear evidence of demand and proven benefits to consumers. It is important that the spectrum is used to the maximum extent possible so that the greatest benefits can be derived. It is also important that considerable investments in existing systems that are in operation are not jeopardised, and where changes are required appropriate compensation is provided.

Question 12

We would welcome views on the potential for more widespread use of market basedapproaches to the spectrum under review such as third party band management, and the regulatory steps which would need to be taken to facilitate this.

It is unclear what problem Ofcom is aiming to solve or what new benefits are anticipated. The present arrangements where Ofcom managed spectrum is available across a wide range of bands, along with other new self-managed spectrum available following auctions, works well at present. It is not clear that third party band managers would be able to manage the spectrum at lower cost (given the economy of scale, existing IT system investments and free technical expertise provided by industry to Ofcom's committees) or would achieve substantially greater use. Fragmenting the management of fixed links spectrum could make it harder to accommodate requirements since if Ofcom itself manages numerous bands it would be easier for them to identify an alternative band in the case that a particular link request could not be accommodated.

Before considering any new band management arrangements or auctioning spectrum with incumbent use, it would be important that Ofcom reviews the fees structure to ensure that existing annual fees are not higher than would be indicated by the market value from the 2008 auction. Otherwise the existing fees could distort spectrum values.

Question 13

(a) Do you consider that any changes should be made to the Ofcom licence fixed link product set?

We have no specific suggestions for new licence products, but would be interested in a facility where major users could access the Ofcom assignment system to batch coordinate a number of links to explore the feasibility of network designs and check spectrum availability before formally submitting licence applications. A reduction in maximum and average timescales for turning around requests for new fixed link licences would also be a welcome development if this can be achieved.

(b) Might a more flexible approach to licensing, in bands where demand is unlikely toexceedsupply for the foreseeable future, enable more intensive use of these bands?If so, what form might the licensing take and in which bands would this beappropriate?

There is already a wide range of bands available under various licensing conditions. We have no specific further proposals at this time but would suggest this question is kept open in the future.

(c) Are there other actions which Ofcom could take to improve spectrum efficiency by encouraging migration to or use of higher, less heavily used, bands, with a view to freeing up spectrum in popular lower frequency bands?

No, sufficient incentives already exist. Arguably the link length policy is not necessary as short links anyway require less power and cause less interference and the policy may lead to underused spectrum rather than preventing congestion.

Question 14

What is your view on the impact of geographically uniform fees for spectrum bandsincluded in this review? If you consider that a geographic fee modifier would promotemore efficientuse of spectrum, how might that modifier be constructed?

BT agrees that it would be appropriate to recognise the fact that in many parts of the UK, notably remote rural areas, there is no prospect of spectrum congestion, when viewed across the range of available bands. There is therefore no spectrum management reason to price spectrum in the same way as in areas where there is much greater demand, indeed the spectrum charges may impede or prevent roll-out of services where spectrum charges adversely affect business cases. In the past (pre-2000) the fixed links licence fees regime did identify congested and uncongested NGR squares in the UK and applied two sets of spectrum charges. With the advent of Ofcom a revised scheme looking at congestion around nodes was considered but not taken forward. We agree that it is timely to look at this issue again and we would advocate a relatively simple approach to identifying areas of the UK where spectrum fees can be reduced. This could be based on assessment of fixed links

density when considering multiple bands together. This is important because if the analysis is instead done on a band by band basis it is likely that it will reflect the fact that an operator has picked one particular band and would falsely indicate spectrum congestion in a given area. By way of illustration of the concept, an analysis of links operated by BT has been undertaken and the link density in 100km grid squares has been evaluated (see figure 1 below).

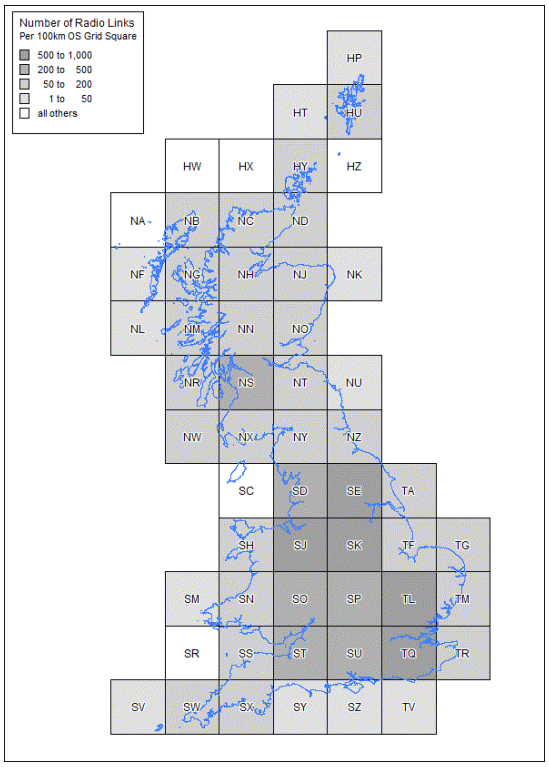

Figure 1: Analysis of link density in each UK NGR square

Our suggestion is to discount licence fees in the areas of the UK where there is a low density of links when considering all available bands.

An alternative or combined approach could be to target reduced fees on areas of low population density, since this may correlate well with the fixed links density and likely additional future demand. By way of an example, an analysis of density of premises per square km across Great Britain is shown in figure 2 below.

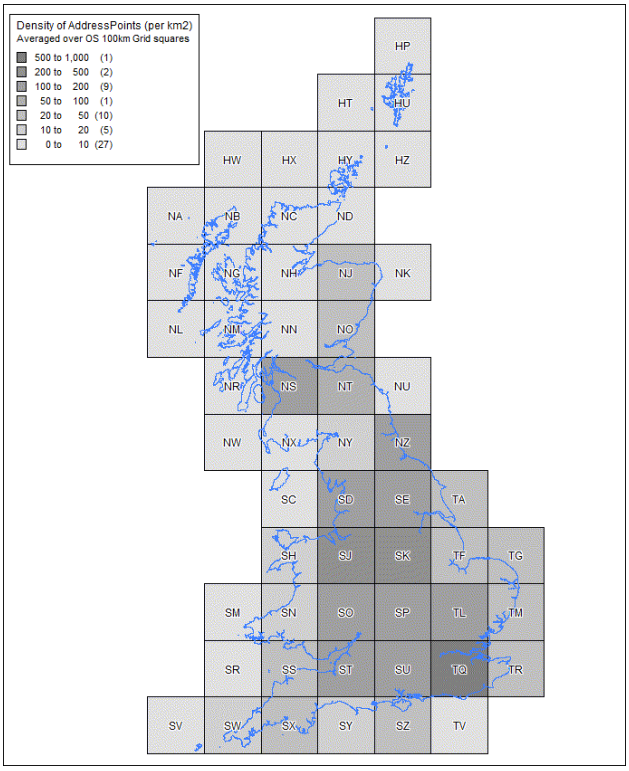

Figure 2: Analysis of density of GB premises

If the existing fixed link density is multiplied by the density of address points (as a proxy for population) in each grid square, the results in Figure 3 are obtained.

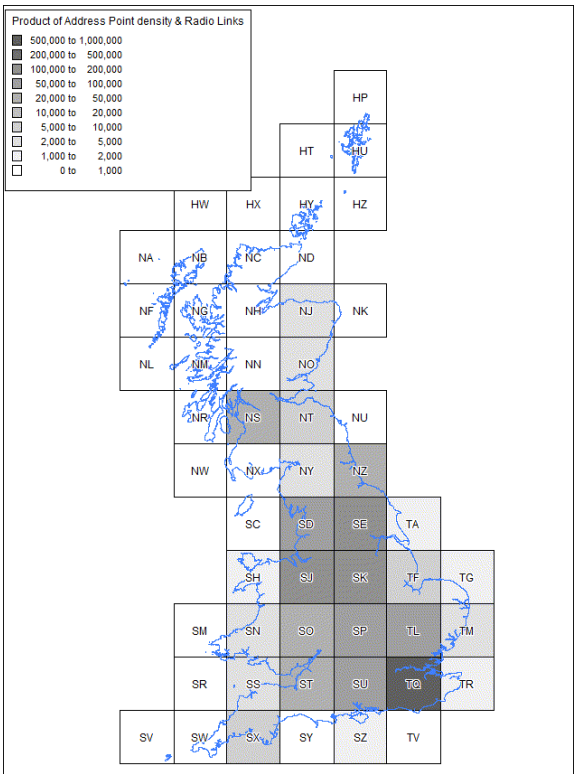

Figure 3: Analysis of the combination of link density and population density

We would be pleased to work with Ofcom to develop proposals for areas where fixed links licence fees should be reduced from present levels, to reflect the fact that spectrum is unlikely to become congested in these areas and that the present fees may discourage spectrum use rather than promote its efficient use. The above analysis is provided as a suggestion and by way of illustration of how such geographic areas could be identified. The actual thresholds used, granularity and other aspects could of course be further discussed.

Question 15

Are there other aspects of the review on which you have evidence that would help inform our consideration of these issues and formulate proposals for consultation?

We are concerned that annual spectrum charges are higher than spectrum values indicated in the 2008 auction and would suggest that Ofcom reviews the level of fees with a view to aligning these closer to the auction values while covering administrative costs. Thecurrent fees algorithm could also be examined with a view to reducing the reference fee and removing the link length factor (since the band factor already incentivises use of higher bands and any shorter links use lower powers). An additional discount for links in remote rural areas should also be considered, as discussed above.

Question 16

Is the proposed list of bands to be included within the review (as set out in FigureA.5.1 in Annex 5 appropriate?

Yes, the list seems to be complete.