

**Subject: Response to Ofcom Consultation on Spectrum Review published 31 January 2012**

**Question 1**

*What are likely to be the key underlying factors influencing changes in demand for this spectrum (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.*

We expect that the following factors would play key roles in influencing the scale of growth and decline in the demand for radio fixed links.

- Deployment scale of the next generation mobile broadband (LTE) which will have some drastic increase in the demand for extra links to support the backhaul requirements. The expected small-cell deployment nature of LTE to provide the expected requirements in terms of coverage and capacity especially in the urban/dense-urban areas means even more demands on the number and capacity of radio fixed links.
- The adoption of other transmission media alternatives such as fibre-optic cables may have some impacts on the demand for radio fixed links. The scale of impact will obviously depend and determined by both the fibre's cost and deployment feasibility. We do not, however, anticipate the fibre deployment to have major impact if coincided with the launch of 4G /LTE networks and the resulting increase in mobile broadband traffic to the user devices as this will balance out and could rather lead to both transmission solutions complementing each other due to the extra demand for links (as highlighted above).
- The overall expected growth in internet traffic and possible deployments of cloud computing as well as technologies such as Machine-to-Machine, utilities/Smart Grids could put some extra demand on the volume and capacity of radio fixed links, where radio is employed to provide interconnection or as a backup to provide extra resilience and reliability and perhaps low total cost of ownership (both in terms of Capex and Opex).

**Question 2 related to "A possible trend towards consolidation of demand from mobile backhaul"**

*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?*

As highlighted above in the answer to question 1, our views is that this decline is certainly of a temporary nature, possibly associated with the period of economic decline and investment restrictions by the mobile operators and also to the lack of any major upgrades to the existing mobile networks infrastructure especially on the radio interface side. Operators' strategy has so far been to fully utilise the existing infrastructure and reduce spending where feasible.

This situation will definitely change once operators start the deployment of 4G/LTE with the evolution of mobile broadband services and the resulting increase in traffic to the user devices. This will bring large demand on the number and capacity of fixed links, possibly on

all bands. During this period operators may start to consider other bands that have not been previously fully utilised. We would like to specifically mention here that due a technology nature of the OFDMA systems and for LTE to provide the best capacity and coverage, deployment could well be of small cell nature specially in the urban/dense-urban areas where small cell architectures could be utilised to increase the capacity of a network by delivering the data locally to a smaller number of users (compared to macro deployment). This deployment scenario would mean more demand on the backhaul both in term of capacity and volume, specifically on the radio fixed links.

There are evidence of increased number of fixed links in countries that have already deployed 4G Mobile networks such as in Japan and US. These countries are well known for their high use of fibre; nevertheless they experienced significant increase in the number of fixed links for mobile backhaul due to deployment of 4G networks.

#### **Question 4 related to "Spectrum use by local authorities"**

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

*CCTV is already being widely used by local authorities and police. In fact we anticipate that the CCTV deployments will continue to gradually increase in the UK and this will bring a huge demand on the supporting radio fixed links infrastructure. Typical requirement considerations for CCTV deployment are speed of deployment, cost and operation reliability/resiliency. The inherent nature of radio links especially at low frequency bands would meet these requirements. We expect demands to be more on the lower bands (where the longer hops and slightly obstructed paths are achievable) since the major deployment of CCTV would be mainly in the urban and city centre areas.*

#### **Question 6 related to "Power and water utilities"**

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

*While the Smart Grids deployment is well underway in countries such as the USA, China and Korea, it is still not very clear when the UK will join. However, we still anticipate some level of deployment to start within the next 2-5 years' timeframe and once started this will of course put some strong demands on radio fixed links as part of the supporting network infrastructure. Similarly to the CCTV case, most demands will be on the low frequency bands where the longer hops and obstructed paths are achievable. Typically by its nature the smart Grids meters communication will not require big bandwidth, but rather the deployment will require massive number of links to support the planned geographical coverage requirements.*

#### **Question 7 related to "Broadcasting"**

*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 to broadcasting use or services related to broadcasting?*

*DABs transmitters have much higher coverage distance than mobile cells and DAB's feeds generally require longer hop length than mobile backhaul networks and much less BW. This*

characteristic for the DAB's feeds makes them more suitable for frequencies below 10GHz which are traditionally used for trunks Point to Point radio but with much smaller capacity. The majority of the DAB's radio transmitters will be fed by non-radio transmission. Therefore we do not foresee significant impact on the current use of spectrum due the expansion of DAB services in UK in particular to spectrum above 10GHz bands.

**Question 10 related to "Use of fibre as a substitute for spectrum"**

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

A fibre deployment in a rural area will typically be over larger distances compared to urban areas. The deployment will also be less expensive in rural areas. Basically Fibre deployments require more Capex than fixed links deployments, but fibre has a negligible Opex. Thus it will all depend on how the balance between Capex and Opex affects the deployment business case by identifying the number of years it will take for the sum of the cost for fixed links to exceed that of fibre.

Our views are that both Fibre and Fixed links will rather tend to complement and not substitute each other especially with such massive predicted growth in broadband data traffic and other emerging requirements. Radio will continue to be used mainly in the Access and aggregate links while Fibre will be mainly used in the core.

**Question 12 related to "Band management approach"**

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

Our views are that the central management of spectrum solely remains within Ofcom responsibility and control. Any other newly adopted approach or marketing mechanism would probably risk one party dominating the access to certain bands of the spectrum for certain business sector or technology type. In another words this could lead to the equipment to be much customised to a particular owner/owners of that band. Any adopted model should carefully consider some regulations to avoid the above mentioned scenarios.

**Question 13 related to "Licence products"**

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

(b) Might a more flexible approach to licensing, in bands where demand is unlikely to exceed supply 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 be appropriate?

(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?

In general we believe that no changes required - Ofcom has so far managed the fixed links spectrum issues and licensing very well. Perhaps more flexibility and simplicity would help to

attract more interest from both the equipment vendors and operators specifically on the lightly utilised bands.

For example in regards to the E-band, we do understand that this band is currently under utilised, but we expect increase in the use of this band as LTE rollout takes place in UK. the E-band would benefit from reducing the minimum Channel Separation from 250MHz down to around 50MHz (62.5MHz could be more appropriate as this is  $\frac{1}{4}$  of the current channel raster). This will allow the availability of more channels in this band, also harmonisation with the 6GHz band.

Bands 52 and 55GHz are the next frequency bands up which we believe will be utilised when the lower bands become congested, that is a natural expansion to the next available band up. However, the introduction of the unlicensed 60GHz and the light licensed E-band may interrupt the natural expansion into the next band up and users may just jump to the 60GHz and E-bands depending on scenarios. We expect the 60 GHz and E-bands to be used for dense small cells backhaul where the 60 GHz will be used for the access links while the E-band will be used for the aggregation links.

#### **Question 14 related to "Fee review"**

What is your view on the impact of geographically uniform fees for spectrum bands included in this review? If you consider that a geographic fee modifier would promote more efficient use of spectrum, how might that modifier be constructed?

Maybe OFCOM should consider including Adaptive Modulation as a parameter into the fee calculation equation to reward users that enhance the efficiency using this feature.

In regards to auctioning spectrum, while this provide a means of awarding the spectrum license to who value it most taking away the burden of managing it by Ofcom, it would also encourage the use of non standardised and harmonised equipment. We believe that the best way of licensing spectrum and encourage its most efficient use is by adopting a flexible licensing policy and maintaining harmonisation of use of the spectrum with the rest of CEPT countries. This would allow low cost and economical availability of equipment while maintaining appropriate link availability (quality).

In regards to Asymmetric traffic, there are many issues and concerns related to the introduction of asymmetric traffic. As follows are examples of some issues:

- orphaned spectrum (spectrum that would be left unassigned due to difficulties in pairing it with a reverse link),
- Asymmetric assignment could provide improvement in chains topology, however in urban deployment scenarios where links are short and the service areas are rich of clutters (obstacle to line of sight), chain topology is not a common practice.
- Not suitable for mixing asymmetric and symmetric deployment as this would reduce efficiency and block large part of the spectrum.
- Encourages use of non-standard equipment which will harm the eco system.
- Difficulty in managing interference and coordinating link assignment.
- Introduces problems with cross border coordination.
- Etc.

Based on the above, we believe that asymmetric links deployment is only suitable for block assigned and self managed spectrum and it is not suitable for traditional fixed services PP link assignment managed and coordinated by Ofcom.

On the issue of PMP radio, these could be categorised in two:

- Below 6GHz band
- Above 10GHz band

*For the PMP systems below 6GHz band, the spectrum is very limited and the systems do not provide enough capacity suitable for the requirement for backhaul of base stations.*

*For the PMP systems above 10 GHz, they are restricted to deployment in line of sight. The claimed efficiency are over hyped. The statistical multiplexing gain is often presented excluding scheduler and MAC efficiency. Also when considering advances in PP radio such as integration of QoS and the use of Nodal radio, the economics of PMP radio becoming questionable.*

**Other Issues**

**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?*

**Question 16**

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

Yes.