



**SKY'S RESPONSE TO
OFCOM'S STRATEGIC REVIEW OF SATELLITE AND
SPACE SCIENCE USE OF SPECTRUM: CALL FOR INPUT**

- 1.1 Sky welcomes the opportunity to comment on Ofcom's call for input on its strategic review of satellite and space science use of spectrum ("the call for input").
- 1.2 Sky is a heavy spectrum user, with activities ranging across many frequency bands. We use spectrum to deliver our services (via satellite, DTT, Wi-Fi and mobile), to create our content (using wireless microphones and cameras and programme links) and to connect our customers (through in-home and public Wi-Fi).
- 1.3 Our varied use of spectrum makes us well placed to appreciate the tensions between competing applications which make use of scarce spectrum, and the challenges that policymakers may face when considering spectrum allocation in the medium- to long-term.
- 1.4 Sky strongly supports moves that ensures more efficient use of spectrum, through (for example) the use of newer more advanced and efficient technologies, the application of market forces wherever practical and innovative approaches to allocation and access such as spectrum sharing. This approach is consistent with Ofcom's general duties as set out in statute, including securing the optimal use of the spectrum and encouraging investment and innovation.
- 1.5 Sections 2 and 3 of this response provide brief and high level comments on the call for input. In section 4, we provide specific answers to questions that are relevant to Sky.

2. The motivation for Ofcom's review is unclear

- 2.1 Ofcom states that the reason for issuing the call for input is "*to understand potential demand and supply trends, as well as trends in technology that might mitigate additional demand*"¹. Sky is concerned that this rationale is too broadly drawn, and that there is no clear indication of what the review is seeking to achieve.
- 2.2 Ofcom notes that it has carried out strategic reviews in other areas of spectrum policy – namely with its publication of a mobile data strategy, a PMSE strategy, and a strategic review of UHF bands 1 and 2. Sky considers that while each of those strategies was relatively 'high level' in scope, they nevertheless focused clearly on specific policy challenges that had been identified. For example, the PMSE strategy was launched in response to proposed changes to the spectrum allocation in the 700 MHz band. Similarly, the UHF strategic review examined possible options for band reconfiguration in line with European arrangements.
- 2.3 In contrast, this strategic review does not identify any specific policy issues it is seeking to address in the satellite and space science sector. Indeed, the call for input specifically highlights that it "*is not aiming to replicate the engagement we already have in place with stakeholders on a range of existing, shorter term issues, including those discussed in the run*

¹ The call for input, "About this Document".

up to the World Radio Conference 2015 (WRC-15)². Instead, the strategic review aims to look forward over the medium and long term, up to a 20 year period.

- 2.4 It is difficult to predict with any certainty market developments that may occur during the timescale Ofcom is examining. The questions posed in the call for input relate to changes in demand, supply and technology – factors which are inherently uncertain over such a long time period. Ofcom would not be able to take significant policy decisions on the basis of such assessments given this uncertainty.
- 2.5 As Ofcom briefly acknowledges, policy relating to satellite spectrum also has to take account of international organisations and associated regulations. It is unlikely that any significant changes in approach could be achieved without wider coordination.
- 2.6 Sky considers that there are a number of policy issues related to this sector which may warrant consideration as part of a wide ‘strategic’ review. These include, for example, the potential use of frequencies above 6 GHz for new 5G mobile standards, or the sharing of spectrum in the 5 GHz with licence-exempt devices. The current scope of Ofcom’s review excludes these issues.
- 2.7 If Ofcom proceeds with this review, then it should more clearly set out the objectives it is seeking to achieve, its justification for undertaking this work, and how such a programme fulfils Ofcom’s duties and is in accordance with its regulatory principles of targeted, proportionate intervention. This will enable stakeholders to more meaningfully target their contributions.

3. Sky makes use of satellite spectrum in a number of ways

- 3.1 A number of Sky’s activities in the UK make use of satellite spectrum and as such fall within scope of Ofcom’s review.
- 3.2 The most prominent activity in which satellite plays a significant role is the operation of Sky’s direct-to-home (“DTH”) satellite platform in the UK and Ireland. Sky’s wholly-owned TV channels are broadcast via satellite, along with requisite service information for our platform (such as EPG listings). Third party channels are also available via Sky’s DTH satellite platform – broadcasters make their own arrangements for satellite broadcast of these channels, while Sky provides technical services relating to access for these channels.
- 3.3 A number of Sky’s wholly-owned channels (Pick, Pick+1, Challenge, Challenge+1 and Sky News) are broadcast unencrypted via satellite, and therefore also available to viewers that no longer subscribe to Sky’s pay TV services but still have Sky set top boxes, as well as to households that have Freesat set top boxes. Freesat is used in 1.9m households³. For a large percentage of the population, digital satellite is the primary method of access to channels from Sky and other providers (including the BBC and the commercial PSBs). More than 40% of total TV viewing hours in the UK is consumed via digital satellite.
- 3.4 Sky also uses satellite to broadcast its content outside of the UK. Sky operates DTH satellite platforms in Germany, Austria and Italy. As in the UK, these platforms give viewers access to Sky’s wholly-owned TV channels and third party channels, all of which are broadcast via satellite.
- 3.5 Sky also broadcasts Sky News International via satellite across Europe, Africa, Middle East, Asia and Australasia from a number of different satellites and orbital positions.
- 3.6 Finally, Sky uses satellite programme links to gather video and audio content for Sky’s sports and news channels.

² The call for input, paragraph 1.5.

³ See Freesat 2014 Q4 performance, available at: <http://bit.ly/1NkYyzi>.

- 3.7 Sky also has interest in potential future use on a shared basis of spectrum currently used by earth exploration and space research services. Ofcom will be aware from previous submissions that Sky considers it imperative for licence-exempt access to be enabled in the 5 GHz band (specifically 5350-5470 MHz and 5850-5925 MHz) at the earliest opportunity, in order to meet the growing demand for wireless data transfer via Wi-Fi.

4. Response to relevant questions

Q1: Do you have any comments on our approach to this review?

- 4.1 As noted in section 2, Sky does not consider that the rationale for this review is sufficiently clear. Ofcom is not precise in identifying the need for a strategic review and gives limited indication of what it is seeking to achieve through this process. Nor are any gaps in the current approach to spectrum allocation or regulation highlighted.

- 4.2 If Ofcom is to proceed with this review, then it should more clearly set out the objectives it is seeking to achieve, its justification for undertaking this work, and how such a programme fulfils Ofcom's duties and is in accordance with its regulatory principles of targeted, proportionate intervention. This will enable stakeholders to more meaningfully target their contributions.

Q2: Do you have any comments on our broad overview of the satellite sector set out in this section? In particular, do you have comments on the completeness of the list of applications, their definitions and their use of the relevant ITU radiocommunications service(s)?

- 4.3 In general, Ofcom's overview of the satellite sector appears accurate.

- 4.4 Specifically, however, we note that in the definitions listed at 3.2, "FSS" is defined by the ITU as being for "two-way communication links between satellites and earth stations". As Ofcom acknowledge elsewhere in the document⁴, the FSS band is also used for DTH broadcast TV. Given that this band has been used for DTH broadcasting since the 1990s Ofcom should consider whether an initiative to enshrine this use in the definition of the FSS band would safeguard this use case, which is essential to European broadcasters and beneficial to European GDP.

Q4: Do you have any comments on our representation of the value chain for the satellite sector? How do you think industry revenues are broken down between players at different positions in the chain?

- 4.5 Sky considers that Ofcom's value chain is an appropriate representation of the various roles in the satellite sector. Ofcom is right to note that individual companies may play more than one role in the value chain.

Q5: What is the extent of your organisations' role(s) in the value chain? Which satellite applications does your organisation: - use; - provide; or - help to deliver? Please list all applications that apply and your role in each in your response

- 4.6 As noted in section 3, a number of Sky's activities are in scope of Ofcom's review. These are: DTH broadcast of services directly to customers; broadcast of content out of territory; and programme links for receipt of video and audio content for Sky's sports and news channels.

- 4.7 As such, Sky plays a number of the roles outlined in Ofcom's value chain.

4.7.1 *DTH broadcast of services:* network and service provider, distributor, content or application provider.

⁴ For example in paragraph 3.5, Table 1.

4.7.2 *Broadcast of content out of territory:* distributor, content or application provider.

4.7.3 *Programme links:* earth station / teleport operator, user.

Q6: For each of the satellite applications you use, provide or help deliver, and taking into account your role in the value chain, where applicable please provide:

- the specific spectrum frequency ranges used for each application, distinguishing between the frequencies used for service provision, for the feeder / backhaul links and for TT&C ;

- the coverage area for services links; or, in the case of TT&C and feeder / backhaul links, the location of the gateway station(s);

- the estimated number of users (e.g. MSS terminals, DTH subscribers, FSS earth stations); - an estimate of the average use by end user (for those applications for which the demand for spectrum is driven by end user traffic); and

- for applications for which the demand for spectrum is driven by other factors, please state what the factor is and the scale of the factor (e.g. for DTH TV the number of TV channels broadcast by format).

Please provide your response with respect to the UK, the rest of Europe, and other parts of the world where this may be relevant to UK use

4.8 Below we provide relevant information for each use case identified.

DTH broadcast

4.9 As noted, Sky operates DTH satellite platforms in the UK, Ireland, Germany, Austria and Italy. These platforms provide access to Sky's wholly-owned TV channels, broadcast by satellite, as well as third party channels from other broadcasters.

4.10 In the UK, Sky currently uses multiplexes in the FSS and BSS uplink bands and the corresponding downlinks are used for DTH broadcasting. Sky's DTH satellite capacity is leased from SES, and the orbital slot is nominally 28.2/28.5 degrees East. The frequencies used are within the range 12.75 – 14.50 and 17.30 – 18.10 GHz (UL) and 9.75 – 12.5 GHz (DL). Sky's DTH broadcast facilities are situated in Chilworth, Hampshire, and Fair Oak, Hampshire. Other broadcasters and service providers use further frequencies and teleport locations to deliver their services to Sky UK DTH and Freesat customers.

4.11 In addition Sky Germany uses multiplexes for DTH broadcasting leased from SES at 19.2 degrees East and Sky Italy uses multiplexes for broadcasting leased from Eutelsat at 13 degrees East.

4.12 Freesat is also available in 1.9m households. In 2014, viewing via digital satellite (i.e. both the Sky platform and Freesat) accounted for 40.5% of total TV viewing hours, while individuals in digital satellite households watched on average 219 minutes of TV content per day⁵.

4.13 More than 600 channels are available via the Sky DTH satellite platform, including more than 80 HD channels. Viewers can also access a number of radio and interactive services.

Broadcast of international content

4.14 Sky News International is broadcast in Standard Definition across Europe, Africa, Middle East, Asia and Australasia on a number of different satellites and orbital positions. It is initially uplinked at Intelsat's Fuchsstadt uplink in Germany to Intelsat IS20 at 68.5E in the C-band.

⁵ Ofcom CMR 2015.

- 4.15 Sky News International is also broadcast in High Definition, across the Middle East, North Africa and Eastern Asia. It takes two routes: uplinked in Israel by RRSat to Measat 3A at 91.5E in the C-band, and uplinked in Paris by Eutelsat to Eutelsat 7 West at 7.3W in the Ku-band.
- 4.16 Sky News International reaches over 102 million homes worldwide across 127 different countries.

Programme links

- 4.17 Sky makes use of satellite programme links in gathering content for its news and sports programmes. In the UK, Sky currently operates around 30 roving news and sports trucks from which these links are used.
- 4.18 Sky has permanent access to 11 x 12 MHz blocks and 1 x 9 Mhz block in the range 14.016 – 14.488 GHz (UL) and 11.082 – 12.541 GHz (DL) for content gathering purposes. A further 8 narrowband (64 KHz) channels are available between 14.375 – 14.410 GHz (UL) and 11.075 – 11.111 GHz (DL) are used for data. Sky leases capacity through Eutelsat, and the orbital slot is nominally 16 degrees East. Hubs for backhaul feeds are situated at Chilworth and Osterley

Q7: For each of the satellite applications you provide, please could you indicate how UK consumers and citizens benefit from their use? Where possible please also provide an indication of the scale of the benefits (either qualitatively or quantitatively).

- 4.19 Each of Sky's satellite activities contribute to the creation and broadcast of high quality content to UK consumers and citizens. The benefits of this are clearly significant.
- 4.20 Sky's DTH satellite platform delivers a wide range of quality content and choice to our subscribers. An important component of this offering is Sky's wholly-owned channels, which taken together deliver a mixture of popular US and international programming, original UK productions (which are growing at an increasing rate), high quality sports content and movies from around the world. Furthermore, for a large percentage of the population the platform is the primary method of access to the channels offered by public service broadcasters, as well as a number of other free-to-air channels. Sky's satellite platform also provides subscribers with access to a large number of partner channels across numerous genres, contributing significantly to the wide choice of services available to consumers.
- 4.21 Sky's DTH satellite platform is therefore a key aspect of the UK broadcasting ecology, driving innovation in the market and significantly widening consumer choice. As such, it makes an important contribution to the fulfilment of a number of Ofcom's duties, including promoting competition and ensuring the availability of a wide range of television services which are of high quality and appeal to a variety of tastes and interests.
- 4.22 Sky's programme links are most typically used to provide news and sport content that requires broadcasting on location. All of these channels are widely used and highly valued by consumers. In particular, Sky News makes a significant contribution to media plurality in the UK, and indeed in other parts of the world through Sky News International.

Q9: For each of the satellite applications you use, provide or help deliver what do you see as the a) current demand trends; and b) underlying current and likely future drivers of demand for the satellite application(s) your organisation uses or provides?

Please include in your response for both a) and b) above: - the scale and future impact of the trends/drivers on demand; - any variations in the type and scale of trends/drivers by geography (i.e. in the UK, the rest of Europe, and other parts of the world where this may be relevant to UK use) and why; - whether future demand is expected to be temporary or

intermittent, and the reasons for this. In your response, please provide any evidence which supports your position on the drivers of demand (e.g. forecasts, studies and statistics).

- 4.23 As noted, Sky considers that trends in demand, technology and business models are inherently difficult to predict over the long timescales that Ofcom is seeking to examine. Notwithstanding this view, below we provide relevant high level information for each use case identified.

DTH broadcast

- 4.24 There is a finite amount of spectrum available at the chosen orbital slot which has meant shortages have arisen in the past. Currently, however, there is no shortage, despite the increasing amount of HDTV being delivered, thanks to improvements in compression technology.
- 4.25 Following significant growth in the last decade, the number of channels available in the UK has largely plateaued. Consequently, demand for satellite broadcasting spectrum fluctuates primarily on the basis of technological developments. As new broadcasting standards are introduced with higher picture resolution, a greater amount of spectrum will be necessary (either to deliver newly launched services, or services that choose to upgrade their broadcasting standards and require greater bandwidth). Conversely, compression improvements due to encoder development and new standards, which reduce the amount of transponder capacity a broadcaster requires, help to reduce demand.
- 4.26 The most notable change in demand in the last decade has been the advent and subsequent popularity of HDTV. After launching our first HD channels in 2006, around 80 HDTV channels are now available to Sky DTH customers.

Broadcast of international content

- 4.27 The broadcast of Sky News International via satellite – both currently and in the future – is determined by whether such a venture is commercially viable in any particular territory. This includes consideration of the cost and availability of satellite capacity in the territory concerned.

Programme links

- 4.28 Demand for programme links is driven by the volume of sports events and news stories that are being covered at any given time on Sky News and Sky Sports channels. The 24/7 nature of live news from anywhere in the world and extensive coverage of sports within the UK and further afield necessitates guaranteed access to satellite spectrum, often at very short notice, to satisfy demand. Terrestrial programme links are also being used to flexibly supplement the satellite feeds cost effectively.
- 4.29 Occasional use of other spectrum is made in the Ka band at orbital location 9 degrees East (operated by Eutelsat), the Ku band at orbital locations 23.5 degrees East (operated by SES) and 24.5 degrees West (operated by Intelsat) and at territory dependent orbital locations in the C-band. The licences for the use of these frequencies are held by third parties. Some of this use is outside the UK although terrestrial fixed and wireless broadband solutions (including aggregated IMT bearers in devices using multiple SIM cards) are increasingly used for occasional links. IP delivery is also used occasionally over satellite in conjunction with Adaptive Bit Rate encoding and may figure more in future to improve efficiency.
- 4.30 Large changes are not foreseen at this time and Sky's requirements are met, and are expected to continue to be met, using the facilities mentioned above.

Q11: Do you have any comments on the list of potential mitigations we have identified? What likely impact would each of the mitigations have on spectrum demand? E.g. what order of magnitude increase in frequency re-use might be achieved? To what extent do you believe that these mitigations apply only to certain applications?

- 4.31 Sky supports moves to ensure more efficient uses of spectrum. Many of the steps Ofcom identifies fall into this category. However these, and indeed any other opportunities that are identified or emerge, are likely to be market driven. Sky does not consider that there is a pressing need for Ofcom to take a leading role in this area.
- 4.32 A number of the mitigations Ofcom suggests are already being applied to satellite use of spectrum. For example, tighter beam focusing is available where demand has been established, and new technologies such as DVB-S2 and S2X have been developed by industry consortia. Satellite operators will no doubt provide further examples of mitigations but, in general, these are in areas in which commercial pressures are likely to provide more effective and timely solutions than regulatory actions.
- 4.33 Specifically on the topic of orbital slots, whilst we believe that greater utilisation of these slots through the avoidance of “paper satellites” is a valid aim, Ofcom should be mindful that satellites are occasionally moved to different orbital locations to enable timely service and product launches rather than to safeguard allocations. Any initiatives that Ofcom takes in respect of this aim must not restrict the movement of satellites to temporary stations when there are service delivery requirements for so doing.
- 4.34 One area in which Ofcom could encourage more efficient use of spectrum is in relation to the potential mitigation it identifies of “increasing the efficiency by which satellite networks share spectrum resources with other users (e.g. terrestrial applications)”. Sky believes that there is great potential to expand the licence exempt bands currently available for Wi-Fi between 5 and 6 GHz where a variety of mitigating technologies and techniques could be introduced. For example, both cognitive sensing and the use of geo-location databases could be considered to ensure that existing uses and users are safeguarded while opening up the use of the spectrum for licence exempt use during defined time slots and at precise locations. Ofcom’s should consider gathering further information in this regard to support potential spectrum sharing.

Q13: Beyond the activities already initiated and planned for the satellite sector (e.g. as part of WRC-15), do you think there is a need for additional regulatory action that may, for example, help your organisation to address the challenges it faces? In your response, please indicate what type of action you consider may be needed and why, including any evidence to support your view.

- 4.35 As noted above, Sky considers that Ofcom should be active in exploring the extension of Wi-Fi allocation in the 5 GHz band. Sky has submitted previous evidence to Ofcom which confirms the heavy usage of 5 GHz that is already being experienced in dense urban areas. Given this, Ofcom should take steps to accelerate the process and advocate far more forcefully for such an allocation.