BBC response to Ofcom's *Call for Input: Strategic review of satellite and space science use of spectrum*

13 August 2015

Overview

1. The BBC welcomes the opportunity to respond to Ofcom's Call for Input for the *Strategic review of satellite and space science use of spectrum* published on 4 June 2015.

2. The BBC puts satellite systems to many different uses to provide programming in the UK and in other parts of the world.[1] Live events, reporting from remote locations, and UK free-to-air platforms are all supported by satellite links and in many cases there is no realistic alternative way to deliver these services.

3. In the UK:

    - 665 Satellite News Gathering (SNG) systems (including BGAN terminals, VSAT terminals and 25 TES vehicles) enable the BBC to broadcast live events and deliver news reports from remote locations where stories are happening.

    - 320 DAB transmitters and 14 MW transmitters rely solely on satellite feeds.

    - 1.3 million households relay on Freesat on their primary TV set. Freesat is a venture between the BBC and partners providing direct-to-home satellite programming. It provides free-to-air television to homes outside the terrestrial transmitter network and ensures universal coverage so all households, across all parts of the UK, can access BBC services on at least one platform.

4. And in other parts of the world:

    - The BBC Arabic language TV channel reaches an audience of more than 32 million across the Middle East and Africa and the BBC Persian language channel more than 14 million homes across Afghanistan, Iran and Iran via direct-to-home satellite.

    - The World Service and World News global satellite distribution systems provide multi-lingual TV and radio broadcasts for re-transmission in the Americas, Africa, Asia and Asia Pacific. This relies on C-band spectrum.

5. Where possible, the BBC has already taken advantage of opportunities to use spectrum more efficiently in its satellite operations. In the UK, we have already upgraded 95% of SNG vehicles and 'flyaway fleet' (i.e. transportable equipment with satellite capabilities that is not vehicle mounted) from DVB-S to DVB-S2.

6. In the UK, the BBC is meeting audience demand for HD and BBC News has begun the transition to HD. More efficient coding techniques will be helpful in that the increase in bandwidth required will be less than with current technology, but our overall demand for satellite spectrum is unlikely to decrease.

7. Ka and Ku-bands are heavily used for programme making and operational capabilities in the UK, and to meet news requirements Ku-band is favoured over Ka. This is not only due to the physical characteristic of Ku (i.e. it is less likely to suffer from interference from rain etc) but also because the services offered by providers in Ku band are better suited to our requirements.

8. Internationally, the BBC is heavily reliant on satellites for contribution, communication and distribution. The BBC World Service Group (WSG) [2] with its weekly global audience of 283 million people currently relies on Ku, Ka and C-band to distribute its multi-media, multilingual content to audiences across the world. If audience figures are added for BBC Worldwide (for BBC content commercially available outside the UK) the weekly global audience figure reaches 308 million people. BBC Worldwide also uses Ku and C-band satellite services as part of its global distribution to customers.

9. In short, the BBC provides significant value to UK citizens and to the UK's standing in the world through its provision of service dependent upon satellites. As a leading user of satellite, we would welcome the opportunity to discuss our uses with Ofcom in more detail in order to make the fullest contribution possible to this work.

10. We would also be glad to discuss our experience dealing with interference in other parts of the world including a recent incident where the launch of a new satellite would have resulted in the total loss of BBC services across Asia. We believe that changes to the satellite filing process at the ITU might make it easier to notify administrations when these problems occur.

[2] WSG includes World Service, BBC Worldwide, BBC Media Action and BBC Monitoring.

11. More generally we:

- Encourage Ofcom to make sure the value created by satellite use is not diminished by sharing with unsuitable systems at the expense of future operational capabilities and flexibility for users.

- Welcome Ofcom's recognition that certainty about the future of satellite spectrum bands in the longer term is required to enable users to invest in new systems with confidence. This could mean certainty of access and fee levels for systems which can last more than 25 years.

12. We expect that any new proposals resulting from this CFI will be consulted on separately, so we can provide relevant use information and consider the specific proposals at that time.

13. Further detail is provided below on those questions most relevant to the BBC's use.

Answers to questions in Ofcom's Call for Input

Question 1: Do you have any comments on our approach to this review?

14. We welcome Ofcom taking account of the international context for these services and are encouraged that Ofcom is seeking information on the use of satellite applications outside the UK. One of the challenges facing satellite users is managing international systems and the domestic regulatory environment. For any licensed sector Ofcom cannot take decisions without considering the international context, but this is particularly true for satellite systems which require internationally harmonised spectrum to enable services to be reliable, free from interference and globally available.

Question 2: 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)?

15. Ofcom might clarify which categories include Land Mobile Satellite Services as well as one-way Fixed Satellite Services (i.e. one-way signals not used to transmit broadcast signals to consumers).

Question 5: What is the extent of your organisations' role(s) in the value chain? Which satellite applications (as summarised in Table 1 in section 3) does your organisation:
- use;
- provide: or
- help to deliver?
Please list all applications that apply and your role in each in your response.

16. The BBC's roles in the value chain and details on the satellite applications we use, provide and help deliver are set out in tables 1 and 2.

17. Ofcom should note that over time we may choose to outsource services or bring certain functionality in house, which may change our role in the value chain.

Table 1. Summary of the BBC's role in the value chain set out by Ofcom

Value chain component *(as set out by Ofcom in Figure 2)*	**The extent of the BBC's role in the value chain**
Earth station/Teleport operators	***In the UK***: The BBC manages and operates several earth station sites or teleports itself and contracts other companies to operate sites on its behalf. Some teleports in the UK used by the BBC provide feeds for services in the rest of the world. The BBC holds more than 25 TES licences to provide satellite newsgathering services, c. 600 BGAN terminals as well as 30 VSAT enabled vehicles. The BBC also contracts services from companies to provide TES (or similar services) for live events and programme making. ***In other parts of the world:*** BBC WSG use earth station/teleport sites fully owned and operated by other companies. Some BBC local offices also use VSAT terminals for studio connectivity.
Content or application providers	***In the UK:*** BBC content is delivered over satellite via Freesat as well as Sky and these services are popular. Digital satellite (e.g. Freesat and Sky) accounted for 40.5% of all total viewing hours in 2014.[3] ***In other parts of the world:*** The BBC's WSG provides content to millions of homes distributed via DTH satellite as well as via terrestrial networks using satellite feeds. The economic benefits of satellite services being available over wide areas make satellite services attractive to broadcasters such as the BBC because a single satellite can cover many hundreds of partners and transmission sites. It is a cost effective way to distribute WSG content to audiences. BBC Worldwide distributes channels including CBeebies, BBC Entertainment, BBC Lifestyle, BBC Knowledge, BBC Earth, BBC Brit and BBC First (among others depending on country

[3] http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr15/CMR_UK_2015.pdf

availability). BBC World News is also offered.

Users	The BBC uses the following applications delivered over satellite as detailed in table 2.

Table 2. Satellite applications currently being used, provided or delivered by the BBC

Satellite applications *(as set out by Ofcom in Table 1)*	**The BBC's role in using, providing and or helping to deliver satellite applications**
Direct-to-Home (DTH) Broadcast TV	***In the UK:*** DTH broadcast TV is provided by the BBC through Freesat. The BBC also helps to deliver DTH broadcast TV to homes in the UK providing feeds of our channels through our distribution network. In the UK DTH broadcast TV from other countries is used by the BBC to deliver other services such as TV footage for news reports where for example the BBC has an agreement with a foreign news provider. DTH transmissions are also an input to monitoring of global freely available news sources which contribute to the BBC's programme making and to provide a commercial service. In this way we are a user of the broadcasts, but add value through analysis and provision of content for news programme makers. ***In the other parts of the world:*** BBC's WSG provides DTH TV and radio services (through satellite network providers) to audiences in Europe, Indonesia and some parts of the ME and North Africa (mainly, although not always, in Ku band). Channels delivered through a DTH platform include BBC Persian TV, BBC Arabic TV and BBC Americas. This contributes to the BBC's global reach of 308 million people weekly. [4]
Broadband internet access	***In the UK and in other parts of the world:*** Broadband internet access services provided by satellite networks are used by newsgathering operations.
Commercial Mobility	***In the UK and in other parts of the world:*** Satellite phones are used by the BBC's newsgathering teams in geographic locations where standard mobile phone technology does not work. BBC Media Action relies on commercial MSS services for communication between its London head office and staff working in places such as Somalia and Nepal. These MSS services are used to provide safety of life services to staff during times of civil unrest or national emergency such as during the recent Earthquakes in Nepal.

[4] Source: http://www.bbc.co.uk/mediacentre/latestnews/2015/combined-global-audience (figures include 39 million BBC Worldwide)

Corporate Networks	BBC News (including World Service and World News), and BBC Nations and Regions use VSAT networks to deliver live audio and video from source to studio and back. BBC News (including World Service and World News) and BBC Nations use BGAN for transmitting files and for emergency distress. This enables reporters to edit in the field and send work back to broadcast centres so they can be used in news and other programming. Local World Service offices which gather and produce content also use VSAT services for studio connectivity.
Navigation	*In the UK and in Europe:* In addition to commercial navigation systems (e.g. GNSS, GPS), the BBC use Truckmapper across the UK and Europe which allows producers to track the location of SNG and other newsgathering vehicles in real time on a map. This service may be expanded in the future.
Distribution of broadcast content	In many cases, both in the UK and around the world, the BBC uses satellite systems to deliver TV, radio (digital and analogue) and interactive services to transmitters for onward transmission. This includes instances where the BBC uses a network from a service provider and where the BBC delivers its own content to terrestrial transmitters. *In other parts of the world:* In addition to DTH, satellite systems are an essential part of the BBC's distribution of TV, radio (digital and analogue) and interactive services to transmitters for onward transmission and also to partners or customers. The international distribution systems for BBC World Service, BBC World News and BBC Worldwide use a number of different satellites to achieve global coverage, generally on Ku band for European and MENA distribution and on C band for distribution for the rest of the world (e.g. North America, Latin America, Africa, Asia and Asia Pacific). Receive-only downlinks used by broadcasters like the BBC can serve many different users, for example the single downlink on Ascension Island feeds the vast majority of shortwave and FM radio services retransmitted into Africa and the downlink in Mazar, Afghanistan feeds an FM radio transmitter serving a local population.

Contribution and Occasional Use (OU) TV	*In the UK:* On a global basis, in order to provide material for UK and international audiences, BBC News (include World Service and World News), and BBC Nations and Regions use TES for newsgathering and live events (the BBC holds licences for these uses). BBC Sport and other programme makers rely on comparable services provided by a third party and not by the BBC itself. External providers are also used to supplement the BBC's systems where programmes require additional capacity (e.g. during the General Election and for the Olympics. Extra capacity is also used to replace BBC SNGs on long-term maintenance/refurbishment). The BBC also uses satellite feeds from the EBU to contribute to BBC Sport programming as well as to provide generic news feeds for its partners such as the BBC. The BBC relies on capacity both inside and outside the UK, and World Service additionally uses MSS for live contributions to programmes. On occasion World Service also use OU capacity to access contributions from (or contribute content to) other broadcasters on a global basis. For the Arabic TV DTH service, the BBC has a number of TES and a permanent lease on some satellite capacity which enables the "OU" contribution of content to the channel.
Machine-to-Machine (M2M)	The BBC uses satellite M2M links to provide a 'health check' for transmitters in other parts of the world (approximately 50 globally, mostly FM). This enables the FM networks to talk (using a BGAN system) to the network operations centre in London. The service is provided under an ongoing contract. This alerts engineers to problems with transmitters enabling the BBC to respond quickly to any problems outages.

Question 6: For each of the satellite applications you use, provide or help deliver (as identified in Question 5), 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.

18. To compile this response the BBC has taken a comprehensive look at our satellite use across the organisation for each of the above questions. In addition to being commercially sensitive, this information is subject to change over time. The BBC would be happy to review our most up to date information with Ofcom as the strategic review work progresses.

Question 7: For each of the satellite applications you provide, please could 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).

Direct to home broadcast TV

19. In the UK, digital satellite platforms – e.g. Freesat and Sky – accounted for 40.5% of total TV viewing hours in 2014.[5] And 1.3 million homes rely on Freesat on their primary television set. Some of these homes will be in areas where terrestrial TV is not available and satellite may be the only free-to-view option.

20. In other parts of the world, the BBC reaches a significant number of viewers via DTH satellite – for example the BBC Arabic language TV channel reaches an audience of more than 32 million across the Middle East and Africa and the BBC Persian language channel more than 14 million homes across Afghanistan, Iran and Iran via direct-to-home satellite. The BBC World News services for Europe are on DTH (Ku), Indonesia and across the ME (Ku). As an internationally-recognised brand the BBC brings benefit to the UK and also performs a valued role for UK public diplomacy – content distributed via DTH contributes to this, but for more detail see section below.

21. Outside the UK, the BBC is an internationally-recognised brand and our distribution of broadcast content has indirect benefits for the nation and for the economy.[6] It builds the reputation of the UK's creative industries and enhances the UK's reputation. The World Service also plays a recognised role in public diplomacy, notwithstanding the internationally recognised editorial independence of the BBC.[7] Indeed, one of the BBC's six public purposes set out by the Royal Charter and Agreement, is *"Bringing the UK to the world and the world to the UK."*[8] [9]

22. DTH TV is also a major platform for BBC Worldwide, the main commercial arm of the BBC. BBC Worldwide builds the BBC's audiences and reputation across the world. This means investment in and generating revenues from BBC content, as well as exposure for British creativity globally. BBC Worldwide helps keep the licence fee as low as possible, returning a record £226.5m to the BBC in the last

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[5] http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr15/CMR_UK_2015.pdf

[6] http://www.publications.parliament.uk/pa/ld201314/ldselect/ldsoftpower/150/150.pdf

[7] http://www.publications.parliament.uk/pa/ld201314/ldselect/ldsoftpower/150/150.pdf

[8] http://www.bbc.co.uk/aboutthebbc/insidethebbc/whoweare/publicpurposes

[9] http://downloads.bbc.co.uk/bbctrust/assets/files/pdf/about/how_we_govern/agreement.pdf

financial year equivalent to 12.6% of BBC Television content funding in the year.[10]

Distribution of broadcast content to onward delivery platforms

23. Domestically, the BBC's distribution networks (many provided by third parties under contract) are essential for licence fee payers – UK consumers and citizens. Each week 97% of adults tune into the BBC, many through DTT, DAB or analogue radio where satellite provides a link to the transmitter. [11] In many cases there are alternatives, but not in all cases. In all 320 DAB transmitters and 14 MW transmitters rely only on satellite feeds. Further, satellite links to terrestrial antennas also provide critical back up links to make sure audiences don't lose BBC services if there is ever a fault with the primary link or distribution network.

24. Globally, the BBC's global newsgathering operations rely on satellite applications to deliver live and up to date reporting from wherever events happen – to audiences in the UK and in other parts of the world. In many cases satellite systems are the only way such reports could be delivered, or information could be transported out of the area for UK viewers. In many parts of the world, especially in volatile regions and in times of political instability, news teams rely on satellites not only for live reporting and for filing stories but also for basic communications links (telephone, internet) and for vital emergency distress alarms. BBC Media Action relies on such services for communication between its London head office and staff working in places such as Somalia and Nepal. These MSS service are used to provide safety of life services to staff during times of civil unrest or national emergency such as during the recent Earthquakes in Nepal.

Contribution and occasional use

25. In the UK, the BBC provides its own satellite links (e.g. TES) to provide coverage of events of national and international importance to viewers as well hiring

[10] http://www.bbcworldwide.com/

[11] http://downloads.bbc.co.uk/annualreport/pdf/2014-15/bbc-annualreport-201415.pdf

similar services from outside companies. Satellite links are crucial for live coverage of events – live coverage of Wimbledon this year was watched by 28.2 million people over the course of the tournament.

Monitoring

26. BBC Monitoring tracks open source media from around the world in multiple languages in order to understand and explain the world's news and views. This 24x7 monitoring of TV, radio, press, internet and news agencies is provided by the BBC to a range of customers in the UK and around the world. These are commercial clients, including media organisations, NGOs, universities, and the UK government. [12] This helps BBC News remain a world leader in covering global news and events providing access to footage from TV channels around the world for the UK audiences. [13] Satellites operating at Ku and C-band in particular, are crucial to this work.

27. When content, information or analysis is required from BBC Monitoring, BBC news editors expect it to be available without delay. This service is especially in demand where other communication channels, such as the Internet, may be deliberately blocked (for example during periods of political instability). In these cases receiving satellite signals is often the only way to know what is going on – and to report accurately events to UK audiences. Without the use of satellite systems providing this service would be much more difficult, much slower, and much more costly.

Question 8: From your perspective, what high level trends will affect the satellite sector in the coming years?

28. In the UK, changes in consumer preferences (e.g. for higher picture resolution) could increase the demand for satellite spectrum from programme makers and for distribution. This may be partly met by improvements to technology, but it is not clear to what extent.

[12] Commercial revenues generated by BBC Monitoring help keep the cost of providing this service as low as possible for licence fee payers.

[13] BBC News has agreements in place with other channels around the world to share video and enable global exchange of information.

29. Growth in terrestrial capacity (e.g. fibre and mobile) could also mitigate some of the increase in demand for satellite spectrum, but it will not replace it in all cases. Crucially, some areas/sites will never get the level of fibre connectivity needed to cope with the demands of a major televised event (e.g. golf courses that host the Open once every ten years).

30. In the rest of the world, the requirement to provide reliable and cost-effective contribution to and delivery of multi-media programme internationally to diverse audiences (both in terms of geographical location and access to infrastructure) means that BBC will be continue to be reliant on C-band spectrum for the foreseeable future.

31. The satellite industry continues to invest in C-band (according to a GVF paper presented to an ATU conference in Abuja in January 2015 - APM 15-3 - Input Doc 12) *"In the last 5 years the satellite industry spent $15 billion launching 52 C-band satellites; another 35 new satellites will be launched by 2015, worth a further $10 billion. After launch, satellites can remain in service for 15 years or longer and unlike mobile operators, satellite operators cannot choose to use alternative spectrum bands once the satellite is in operation."* Future opportunities provided by Ka band for delivery may be of interest but it is unlikely that these would provide an alternative to the levels of reliability and the coverage provided by C-band for BBC use in other parts of the world.

Question 9: 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).

Direct-to-home broadcast TV

32. In the UK for direct-to-home satellite broadcasting future levels of demand for spectrum will arise from the balance between demand for increasing video quality (as more of our services become available in high definition) on the one hand, and improvements in video coding and transmission technologies on the other. At this time, it is too soon to say whether in the medium-term (~10 years or so) this will result in an overall increase or decrease in spectrum demand.

33. In some parts of the world, the demand for DTH services will have to continue to be met through C-band services potentially reducing the potential for global roll out of mobile broadband services. In equatorial regions rain patterns cause disruptive harmful interference to signals in alternative bands making them unsuitable for satellite links and DTH services. Additionally, the cost of upgrading equipment is prohibitive to many consumers so broadcasters will therefore retain older technology.

Distribution to onward delivery platforms

34. For UK distribution (e.g. ensuring all terrestrial transmitters receive content feeds) it is unlikely that all sites will be served by terrestrial radio links or fibre links in the future. Currently 320 DAB and 14 MW sites are served solely by satellites with satellite links providing back up in other cases. It is likely that satellite links will remain a crucial element of part of the distribution to the terrestrial network.

35. In other parts of the world demand will also be driven by the number of channels as well as the number of transmitter locations that are not served by alternative links (e.g. fibre). There are some locations where it is likely satellite links will always be needed. The BBC's has a target for its global to reach 500 million by 2022[14] and the satellite component of global distribution will remain

[14] http://www.bbc.co.uk/mediacentre/latestnews/2013/dg-global-audience

crucial part of our ability to deliver content to audiences through a wide variety of platforms basic radio to TV.

36. In the last year, World Service has undertaken a re-procurement of its international satellite media distribution system. As was the case previously, the system uses six satellites for global coverage and covers six different regions, all using C-band spectrum except Europe which uses Ku. There was increased demand in all regions for services to be supported via the new system (e.g. new TV services requiring more bandwidth) but this was taken care of in most cases by the use of more efficient DVB-S2 modulation and a small increase in spectrum requirements in most regions. Given this recently undertaken exercise, we would expect a similar picture in future of, at the very least, static demand and, if anything, a slight increase.

Contribution and OU TV

37. In the UK BBC News is making some small reductions in the number of individual TES licences held for newsgathering and instead opting for VSAT use. This move from large to small antenna is being driven by the benefits of smaller antenna systems which can be automated or operated by journalists versus engineer operated antenna required for larger systems. This this does not mean, that there has been a change in demand, only that we are choosing to use alternative satellite licensing methods to achieve the same goal.

Question 10: Taking into account the drivers you have identified in your response to Question 9 above, what (if any) challenges is your organisation concerned about in meeting potential future demand? Please provide the information by application and band, along with any supporting evidence, if available.

38. In the UK, BBC News has been preparing for the move to HD. Part of this process has involved updating existing equipment (with investment cycles of 10 to 25 years), but the consideration of how additional bandwidth could be met has also played a key role. One concern in moving to HD is the potential for additional costs. While more efficient coding techniques may allow us to make HD

contributions in our existing transponder space the ability to do this is not currently clear and it is possible demand for spectrum may increase.

39. The relative costs of satellite bands are therefore a concern. We understand the difference in the attractiveness of Ku versus Ka band are reflected in the higher cost of Ku-band bandwidth. This reflects not only Ku-band's attractiveness in terms of preferable physical characteristics but also a more suitable range of services offered by providers. With this in mind, the BBC has worked with key suppliers to develop suitable alternative services where possible.

40. In the UK the BBC also faces challenges in C-band where we expect UK use will be curtailed in the future. Services provided by BBC Monitoring use many freely available sources that transmit around the world in C-band and for the reasons detailed in Q9 we expect this will remain the case in many cases. In some instances, monitoring services can be carried out in another way (e.g. over the Internet) but when it matters this isn't always possible. High-interest content delivered over the Internet is often unavailable due to the numbers of users trying to access the server. High Internet traffic levels meant earlier this year BBC Monitoring was unable to reliably access a Q and A session hosted by a world leader over the Internet. C-band reception has already been reduced in the UK by the release of spectrum for broadband wireless access and even with filtering in place this has resulted in the loss of services. Future work may have to be moved from the UK to other countries as a result. This could mean large upfront and ongoing costs. Retaining flexibility for the BBC to obtain C-band transmissions would mean investing in mitigations, such as moving receivers. This is very difficult to justify at the present time without certainty about the future of the band (access and fee levels) for the life cycle of the equipment (more than 25 years).

Question 11: 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?

41. Ofcom suggests that improved modulation and encoding may allow more efficient use of spectrum.

42. The BBC has already invested in new technologies which have improved spectral efficiency. For DTH satellite broadcasting, the BBC has taken advantage of more restricted satellite footprints for the UK that have been offered by our satellite capacity supplier. Although this doesn't reduce the spectrum used by the service within the UK, it does increase overall spectrum efficiency over a wider geographical area by allowing the frequencies used in the UK by the BBC to be reused in other countries.

43. In the UK, we have already upgraded 95% of SNG and flyaway fleet from DVB-S to DVB-S2 in order to improve spectral efficiency. In other parts of the world, despite the variations in local conditions, BBC World Service has nonetheless already upgraded over half.

44. However, most of the BBC's satellite newsgathering is still in standard definition. The development of HEVC may allow us to move to HD, but we will require just as much bandwidth, possibly more. Where available, we are already using LTE networks to increase capability for national news contributions, but this is to increase capability rather than replace existing satellite usage.

45. In order for some of the other of the mitigations Ofcom has set out to meet the BBC's operational requirements there would need to be advances in technology and equipment that are not currently on the horizon. For example, there is a limit to the size of transmitter that can be mounted to a vehicle for satellite news gathering (SNG). For instance to allow satellite spacing of 1.5 degrees, for a given size of vehicle there is a physical limit to the dish size that can be accommodated, larger vehicles can accommodate sports and other events but are likely to be less appropriate for newsgathering on crowded city streets. The BBC must also consider cost when making equipment purchasing decisions and several of the mitigations suggested would not be feasible alternatives on cost grounds.

46. In respect of ITU filings the BBC's experience is relatively limited. The BBC has however suffered from a number of deliberate and accidental incidents of interference to its satellite services and due to the nature and number of satellite filings it has sometimes been extremely difficult to ascertain who the correct regulatory body is in order to lodge complaints.

47. In a recent incident the launch of a new satellite could have resulted in the total loss of BBC services across Asia. After spotting the potential problems we had just two weeks in order to migrate 200+ downlinks to new frequencies which was difficult and there was no opportunity to seek regulatory redress.

48. The biggest problem as a user suffering interference is that the file name and notifying administration is often very different from the country of registration and name of the satellite operator.

49. The BBC would welcome the chance to discuss opportunities to review the satellites filings system, including the potential for simplification and the removal of paper satellites in order to facilitate the ease of use by those wishing to notify administrations about harmful interference.

50. We would also welcome a discussion with Ofcom about how the UK might use its experience of managing coexistence between receive-only downlinks and broadband wireless access (BWA) in parts of C-band.

51. The BBC has seen problems with interference to C-band downlinks for many years. At the beginning of 2012, we confirmed earth stations operating in the C-band and used for international satellite distribution network had been affected by harmful interference from authorised wireless access systems in 15 countries.[15]

52. The BBC experienced similar problems in the UK after 40 MHz of spectrum auctioned for BWA below 3.8 GHz was put into use. The response to this problem was the introduction of Recognised Spectrum Access (RSA) between 3.6

[15] *See further: "The BBC's response to Ofcom's call for input: Future demand for mobile broadband spectrum and consideration of candidate bands."* http://stakeholders.ofcom.org.uk/binaries/consultations/cfi-mobile-bb/responses/BBC_Global_News.pdf

and 4.2 GHz so ROES with RSA could be considered in spectrum management planning and essentially afforded some degree of protection. One of the problems with RSA in this band however is the timing of its introduction. It came into effect after BWA licences had already been issued, and therefore only protects against interference from new licences holders, and not from existing ones. The timing of when protection is offered to ROES is therefore a key factor.

53. Following WRC-15, other administrations are likely to introduce similar services in C-band so it could be beneficial to consider whether protection for ROES is appropriate before new services are introduced. We understand other administrations have approached the ITU on this subject and it might be beneficial for Ofcom to engage on this matter now and consider how useful aspects of RSA in the UK might be applied.

Question 13: 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.

54. We welcome in particular Ofcom taking account of the international context for these services. The international dimension complicates matters when Ofcom is seeking to use pricing to incentivise efficient spectrum use. This is because users who may need to pay for spectrum use in the UK are not always able to take decisions about spectral efficiency when transmissions are from elsewhere in the world. This is true for BBC Monitoring services that have to receive signals on the frequencies other countries use for transmission. This can lead to a loss of valuable services as has happened at C-band.

55. We look forward to further engagement with Ofcom on this matter as well as additional concerns arising from this strategic review.

ENDS.