



NON-CONFIDENTIAL VERSION

Improving mobile coverage

Proposals for coverage obligations in the award of the 700 MHz spectrum band

BT's Response to consultation published on 9 March 2018

4 May 2018

Comments should be addressed to:

Nicola Bean, BT Group Regulatory Affairs, BT Centre, London EC1A 7AJ



Contents

Executive Summary	3
1 Introduction	6
2 Cost based risks impacting proposed coverage obligations	7
3 Timing based risks impacting Ofcom's proposals	9
4 Effects of the proposed obligations	13
5 An alternative approach	17
6 Auction considerations	18
Annex 1 - Responses to the consultation Questions	19
Annex 2 - Utility Quotes	20
Annex 3 - Broadband coverage supporting mobile not spots	21
Annex 4: Auction design considerations	22

Executive Summary

1. BT¹ welcomes this consultation on improving mobile coverage and how this may be achieved in the context of the upcoming 700MHz spectrum auction.
2. Competition between mobile network operators (MNOs) in the UK is intense and consumers and businesses have reaped significant benefits. Prices are low, innovation is high, and 4G coverage and speeds compare very well to other countries². EE has led, and continues to lead, 4G deployment. EE will further expand rural coverage as it delivers the emergency services network contract (“ESN”).
3. In the next few years very large network investments are needed to provide the infrastructure necessary for the UK to deliver the Government’s vision of a world leading digital economy. Government and Ofcom play a vital role in producing an environment conducive to investment. Where investment is uneconomic, industry will need supportive measures if that investment is to be delivered, or be delivered without incurring significant trade-offs in forgone investment elsewhere, particularly 5G. It is against this broader backdrop that Ofcom’s proposals must be assessed.
4. BT supports the Government’s efforts to build a digital economy that works for everyone, including access to good mobile coverage wherever people live, work and travel. A common problem for public policy makers and mobile operators, in all countries, is how to reach very rural areas and deliver mobile service that meets customer expectations, given the limited commercial viability of providing coverage in these locations. The upcoming 700MHz auction provides an opportunity for Ofcom to devise a suitably scoped and realistic intervention to improve rural coverage. The partial sacrifice of auction revenue in exchange for further coverage that may otherwise prove uneconomic is sensible if it is proportionate and the benefits outweigh the costs.
5. BT agrees with Ofcom that it would not be appropriate to include obligations tackling improvements to rail based coverage. Whilst MNOs are dependent upon other stakeholders to support their infrastructure deployment in all circumstances (local authorities, land and infrastructure owners, utility providers etc.), the challenges involved in deployment to improve service on transport routes (given the particular stakeholders involved) are even greater. We welcome the Government’s current efforts to support the development of new models, but this is unlikely to deliver sufficient progress in Ofcom’s proposed timelines.
6. Turning to Ofcom’s proposed intervention, the starting point is to consider where the financial burden of delivering the coverage obligation should lie. Given Ofcom’s position that delivering coverage in these areas is not economic, the coverage obligations could be effectively subsidised through forgoing auction revenues, or by other direct or indirect public funding.

¹ BT including its subsidiary mobile operator EE Limited

² Akamai’s State of the Internet Q1 Report, 2017.

<https://www.akamai.com/fr/fr/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivityreport.pdf>

7. Moreover, to ensure that the auction is as efficient as possible, the price of the unencumbered lots should not be materially affected by the obligations on the encumbered lots.
8. We agree with Ofcom that geographic obligations are in principle the right type of obligation to consider. However, we are very concerned that Ofcom has underestimated the cost of these obligations as well as the timescales for delivery.
9. We are sceptical of the efficacy of a premises obligation. Whilst we agree that consumers and businesses in rural areas require connectivity, a cost benefit analysis is unlikely to be positive for rolling out indoor coverage where customers have outdoor mobile coverage and a good fixed broadband service. These customers can increasingly make and receive calls using WiFi calling and can access data services with WiFi on fixed broadband when indoors. Little weight should therefore be given to the convenience factor of visitors not having to log on to the WiFi network to make or receive calls or start a data session when considering the high cost of providing strong indoor mobile signal to often widely distributed and low density rural premises.
10. We are concerned that £300m is an underestimate of the potential costs of each of the obligations. We are also unclear of Ofcom's exact assumptions about spectrum value of a paired 5 MHz obligated lot based on Ofcom's reference to past auction benchmarks: this makes it hard to provide definitive comments. We anyway propose that the decisions about the coverage obligations should be taken before, and separately to, consideration of the auction design. In particular, the frequencies and amount of spectrum attached to each obligation should be considered as part of the auction design. We suggest that for the auction design Ofcom considers a scheme where the coverage obligations (and associated cost thereof) are sorted out in a second phase after the spectrum is all first assigned without obligations.
11. In light of the above, we consider that Ofcom's approach is flawed with the following significant risks:
 - a. Firstly, Ofcom's proposals risk deteriorating the investment environment for network deployment due to their timing and cost implications, in terms of required resources and capital expenditure, which risk adversely impacting the ability for operators to improve the overall capacity and quality of mobile services via 5G.
 - b. Secondly there is a material risk that the spectrum will be unsold as the obligations are too onerous as regards cost and timing. This risk is exacerbated when factoring in the potential of a fine for non-compliance (up to 10% of operator revenue) pursuant to s.54 Digital Economy Act 2017.
 - c. Thirdly, Ofcom's proposals risk wasteful and inefficient use of public funding.
12. BT considers that the outcomes described above are avoidable whilst still improving mobile coverage. In relation to the design of the coverage obligation, these can be addressed by ensuring the obligations promote longer term, innovative and more holistic approaches to connectivity. In other words, one that is proportionate and appropriate to low population areas, and technology neutral to support more cost-

efficient infrastructure deployment for operators. This could be achieved in a number of ways, including:

- a. Specifying a premises obligation on the basis of good outdoor coverage signal levels and rely on the use of innovative, complementary technologies to improve indoor coverage.
 - b. Avoiding the duplication of the geographic coverage obligations and potentially splitting the geographic obligation across the two encumbered lots to make it feasible to deliver within the time scales envisaged by Ofcom including by reducing the number of stakeholders (and legislative regimes) that an individual operator must engage with to deliver incremental coverage.
 - c. Separately specifying an extended coverage obligation that licensee(s) have to comply with only when EAS sites have been delivered and made commercially available for consumer mobile.
13. We urge Ofcom to keep open the opportunity for stakeholders to comment further on the coverage proposals with the proposed designs for the auction and its rules. Indeed, the consultation is stated to provide initial proposals³ for the coverage obligations. Therefore, we would expect further opportunities to comment as Ofcom's thinking develops.

³ Para 1.5

1 Introduction

- 1.1 BT shares Ofcom's ambition to improve mobile network coverage in areas where deployment may otherwise not be commercially viable. We are open to exploring how this can be paid for and how the costs of achieving this can be reduced and the timescales shortened. We therefore welcome this consultation on how mobile network coverage can be improved using the opportunity of the upcoming 700MHz spectrum auction.
- 1.2 We set out below our views on the key elements of Ofcom's proposals, namely the costs and timing based risks, and the effects of those and how they may be mitigated, as well as the interplay with future auction design. Our answers to the consultation questions are fully addressed in the sections below and summarised and cross referenced in Annex 1.

2 Cost based risks impacting proposed coverage obligations

2.1 Infrastructure deployment costs are unpredictable, particularly in rural locations. For the reasons below, BT believes the number of sites required to meet the obligations will exceed those predicted by Ofcom and require more complex design than expected. This leads to the conclusion that while the capital and operational costs of meeting the obligations (as stated by Ofcom) appear reasonable on face value, there is a risk that the true cost will exceed the £300m envelope suggested.

Deploying infrastructure to provide coverage to 92% of UK landmass, at a signal strength of -105dBm will require more investment than Ofcom predicts.

2.2 Due to a lack of information regarding the specific unserved premise clusters, BT has been unable to estimate the costs of meeting the premise based obligation. However, we have undertaken analysis in respect of the geographic based obligations using radio access network planning tools.

2.3 To meet Ofcom's proposed -105dBm signal threshold would require BT to update c. [X]macro-cell sites and build of c. [Y]new macro sites.

2.4 This comes at significant cost, between approx. [Z]. These costs also assume that these sites are positioned in optimal locations. Therefore, actual costs may well exceed estimates if sites are positioned in sub-optimal locations (through the preferred site/s not being acquired due to planning failure, or landowner reluctance) and/or built to a sub-optimal design (for the reasons described at paragraphs 2.5 – 2.9 below).

Rural topography will have a significant influence on the design and number of sites required to meet the relevant coverage thresholds. As a result, the costs involved are unpredictable and it is unsafe to assume that MNOs can meet the obligations even within the revised expenditure envelope stated above.

2.5 The cost estimates undertaken by BT (and we assume Ofcom) have been completed using mathematical models that assume perfect conditions to support infrastructure deployment. However, empirically deployment costs are likely to be much higher in rural areas due to price of utilities (e.g. electricity and transmission) and bureaucratic/community based pressures that necessitate complex and costly network/site design.

2.6 Where there is low or no population, providing essential utilities to a location suitable for a cell site comes at significant cost. Connecting a site to the National Grid can be prohibitive (please see Annex 2 for case studies illustrating this point) making the provision of power via generators or battery cabinets essential. Not only are these power sources unsustainable from an environmental perspective but they also contribute towards higher operational costs (for example frequent refuelling, repairs, monitoring). Indeed, particularly in remote areas (where the infrastructure is more exposed to the elements than in semi-rural locations), the sites must be specially designed to ensure the equipment can withstand extreme weather conditions that contribute towards site/equipment failures. To help illustrate this point, the deployment of sites in rural Scotland as part of the ESN project has necessitated

bespoke site design that ensures equipment is capable of withstanding: wind speeds of 140mph, sub-zero temperatures and high precipitation.

- 2.7 It is also the case that visual concerns with the mobile infrastructure in rural areas may require operators to build sites that are more sensitive to their surroundings than would otherwise be necessary in more suburban/urban areas. For example, planning approval or site access may be conditional upon design requirements such as:
 - a. Shorter/smaller than normal structures (which can lead to the need for additional sites to deliver against coverage requirements);
 - b. Site security by way of a dry-stone wall rather than chain link fence;
 - c. The integration of the site into existing buildings (again, impacting efficient transmission that can contribute towards higher deployment costs for the MNOs).
- 2.8 It is also common for macro sites built pursuant to rural deployment to models to be supplemented by “hop” sites that enable line of sight transmission. Where there is no fixed backhaul connectivity, a site will use microwave transmission to connect to the nearest site that can provide a connection to the core network. This makes good line of sight between masts vital. Where geographic features interfere with this line of sight, an additional “hop” site (a micro or pico site) must be built to circumnavigate the obstruction. These “hops” inflate the number of sites needed to meet the required coverage, which of course comes at an additional expense. While the “hop” sites are generally smaller than macro-sites, the costs associated with securing relevant access rights and building the relevant infrastructure are not dissimilar.
- 2.9 Where the “hop” costs are substantial, it may be more cost efficient to provide transmission using satellite. However, satellite is a technically inferior to microwave (due to higher latency and lower capacity than microwave transmission) and so otherwise considered an inefficient input cost for MNOs to incur: this again leads to uncertainty regarding the true cost of implementing coverage within the cost envelope suggested.

3 Timing based risks impacting Ofcom's proposals

- 3.1 During the 800MHz auction in 2013, Ofcom made clear that 800MHz spectrum played an important role promoting the wide availability of future mobile services in the UK and that minimum coverage obligations should be provided to a significant proportion of citizens on a reasonable timescale⁴. Consequently, O2 committed to providing indoor 4G voice coverage to 98% of the UK population within a five-year period. Given the coverage obligations proposed as part of this consultation are no less onerous than those attached to the 800MHz auction, it is surprising that Ofcom now proposes a three-year implementation window.
- 3.2 Ofcom states that it has balanced the level of commercial challenge in delivering new coverage – including getting planning permission for and deploying new mast sites in more remote locations – and the benefits to consumers of realising this new coverage in a timely way.⁵ Ofcom is correct to do so, however for the reasons set out below, a three-year implementation window is an unreasonable proposal that fails to appreciate the extent of the challenges that would be faced by a licensee. Further, it neither recognises the scale of third party collaboration required to deliver a site nor accommodates the additional time required for deployment of shared MNO infrastructure, thereby providing an opportunity to minimise the significant deployment costs faced by the MNOs. Ofcom has provided no compelling evidence of the quantum of gains to rural communities that delivery in 3 years versus delivery in 5 years would provide. It is obvious that quicker delivery will bring benefits to some customers but is not good enough for Ofcom to stop its analysis there.

Infrastructure deployment requires significant third-party collaboration. Efficient deployment is only possible where those third parties have aligned objectives: in a property transaction of this kind it's inevitable that the parties will not be aligned. This makes deployment an inherently complex process that will take longer to complete than Ofcom has allowed for, further contributing to the cost based risks identified in this response.

- 3.3 Deployment of mobile network infrastructure is inherently complex. Difficulties obtaining access to sites and securing planning permissions have made deployment (and maintenance) extremely costly and time consuming.
- 3.4 These issues are more pronounced in rural areas because:
- ***Line of sight transmission is critical.*** This limits the number of sites suitable for mobile equipment and architecture. As described at paragraph 2.8, it also inflates the number of sites needed to meet the relevant coverage requirements.
 - ***There is often community concern with the visual impact of sites.*** The aesthetics of a site and its impact on the local environment is highly emotive in rural communities. Local opposition can often impede the planning process and necessitate relocation of a mast to

⁴ Statement Summary “Second consultation on assessment of future mobile competition and award of 800MHz and 2.6GHz spectrum and related issues”, Ofcom, 12 January 2012, paragraph 1.21.

https://www.ofcom.org.uk/__data/assets/pdf_file/0027/55395/statement-summary.pdf

⁵ 1.14

sub-optimal sites. This leads to the use of more sites (and often more expensive infrastructure) to ensure the site is sympathetic to its surrounds.

- ***Given the nature of landholdings in the UK, there are a limited number of landowners controlling large geographic areas.*** There is therefore limited flexibility around who the operators can negotiate with for site access. Very few rural sites location have alternative options on land in different ownership, creating a ransom position for the relevant landowner.

3.5 This means in practice, it can be a 12-18-month process to fully deploy and activate a cell site in rural areas. The process includes:

- Surveying an area for potential locations.
- Identifying relevant landowners.
- Submitting and obtaining planning permission.
- Agreeing terms of occupation with a site landlord.
- Ensuring there is an appropriate transmission solution to support the site.
- Connecting and supplying relevant utilities to power a site.
- Negotiating all relevant legal documentation.

3.6 Delivering [X] sites as part of the ESN project, has pulled into sharp relief how challenging it is to meet ambitious deployment programmes when there are so many 'moving parts' to the process.

3.7 Based on these experiences, and within the current legislative and bureaucratic environment, BT believes it would be incredibly difficult to meet the proposed obligations within a three-year period without (i) incurring additional expenses such as increased manpower costs and/or incentive payments to landlords paying for early site access; or (ii) major reductions in deployment costs.

3.8 The costs risks identified at (i) above will naturally impact any positive business case for meeting the coverage obligation. However, even if an operator could bear those additional costs, the limited number of telecommunication experts in the UK (from lawyers through to engineers and riggers) means a shortage of manpower may also make it difficult to scale up a deployment programme while also delivering other network projects such as 5G.

The three-year implementation window assigns a higher level of certainty that the Extended Areas Services (EAS) project will deliver all sites to schedule than is warranted.

3.9 The successful activation of an additional 250 sites (to be built by the Home Office) under EAS is critical for operators to meet the geographic coverage obligations proposed.

3.10 However, experience running large scale infrastructure projects, and learnings from ESN and MIP (the failings of which cannot be characterised as simple "co-ordination issues") leads BT to the conclusion that it is unsafe to assume all 250 EAS sites will be delivered within Ofcom's three-year coverage implementation window.

- 3.11 As currently designed, the geographic coverage obligation would:
- a. require an operator to meet the 92% coverage threshold even if the EAS sites were not delivered to schedule; and
 - b. incentivise non-delivery of EAS sites by moving the capex costs associated with building these sites from the public purse to the MNOs.
- 3.12 This imposes an unacceptable level of risk upon MNOs that is exacerbated by the risk of a fine pursuant to the Digital Economy Act 2017 (please see paragraph 4.15 for further details) should it fail to meet the conditions of the spectrum licence.
- 3.13 These cost and delivery risks described above contribute to our overall assessment that the coverage obligations are unfeasible in their current form.

While Ofcom proposes cross-operator infrastructure sharing and joint network design to ease the financial implications of meeting the obligation, a three-year implementation window is unsympathetic to such arrangements.

- 3.14 Ofcom is correct to identify in the consultation that the sharing of mobile infrastructure can enable MNOs to expand coverage with lower net costs per operator: the Cornerstone and MBNL joint ventures are evidence of this. However, there are limits to cost sharing (for example each operator has its own network planning requirements dictated by factors such as its spectrum holding that prevents cost sharing) and in any event the three-year implementation window is too short to permit effective sharing.
- 3.15 The implementation period does not contain an allowance for operators to consider what level of co-operation and engagement is required, whether existing sharing arrangements can, or should, apply to these sites and how to most effectively collaborate on site/structure design which accommodates the technical requirements of each operator. The Mobile Infrastructure Project demonstrates the complexities involved in this type of arrangement.
- 3.16 Ofcom proposes that the licensee who has the coverage obligation should be obliged to share information about planned site locations 30 days before it seeks planning. However, that addresses the actions of one party only in the potential sharing arrangement. It is equally important that the incoming sharer is obliged to state their intent within a short time period and give a binding commitment to share the costs of the site as well as work cooperatively on the design, planning and build.
- 3.17 For these reasons, Ofcom's suggestion to engage in better site disclosure practices is also unlikely to improve the ability of an MNO to deploy sites in a quicker, more efficient way.
- 3.18 Indeed, with a three year deployment deadline unilateral site deployment may prove preferable as:
- sites accommodating shared infrastructure tend to be larger, falling outside of permitted development, and requiring the operator to undertake longer, more complex planning procedures; and

- even with the reformed Electronic Communications Code, landlords continue to expect operators to pay a premium for shareable structures and a lease that permits unconditional site sharing, leading to lengthier contractual negotiations with landlords when compared to negotiations for single occupancy sites.

The UK's planning and legislative regimes have not, since 2012, been suitably reformed to justify proposing a three-year implementation window rather than the five years attached to the previous coverage obligation taken by O2.

3.19 While UK Government characterises telecommunications as a fourth utility, there is still some way to go before the legislative framework can support mobile infrastructure rollout in conditions equivalent to those of the energy sector. Indeed, recent legislative reform has not gone far enough to substantially improve the speed and efficiency of mobile infrastructure rollout. In our experience, the reformed Electronic Communication Code has in fact, at least for now, slowed down deployment rates as there is landlord consternation at the prospect of declining site rents that proved to be a highly lucrative source of income for 20+ year period. This, coupled with inconsistent planning regimes across England, Scotland, Wales and Northern Ireland, contribute to significant administrative cost and complexity for MNOs, making it difficult to see a three-year coverage implementation window as a reasonable condition of the obligation.

3.20 BT welcomes Ofcom's support of initiatives such as the Barrier Busting Task Force and expects that in the future, there will be greater opportunity to improve the speed with which MNOs can deploy infrastructure. However, given:

- it took more than five years to consult upon and legislate for the reformed Electronic Communications Code; and
- a 20+ year industry of extracting unreasonable site rents from MNOs is likely to take more than a few years to unwind,

it seems unlikely that recent or future legislative reform is likely to materially alter market conditions ahead of the forthcoming 700 MHz auction in 2019 or within the proposed three-year implementation window.

4 Effects of the proposed obligations

- 4.1 The cost and delivery risks described in sections 2 and 3 of this response indicate that Ofcom's proposed intervention is extremely onerous. Therefore, it is incumbent on Ofcom to demonstrate the welfare benefits the intervention will produce are proportionate to that cost. For the reasons outlined below, we are sceptical that up to £900m of public funds are justified by the benefits Ofcom describe. This is particularly the case given that some of the benefits described can be delivered by means other than extending rural mobile coverage such as through WiFi calling. The nature of Ofcom's intervention fails to warrant innovation into new technologies that will ultimately benefit all UK citizens and risks undermining Government policies designed to optimise conditions for timely and efficient 5G deployment.
- 4.2 The use of two coverage obligations will deprive Treasury of £600m of auction receipts but so far it is unclear whether this is proportionate (or efficient expenditure).
- 4.3 Unless the two geographic obligations are to provide extended coverage for two mutually exclusive footprints, justification for two licence obligations appear weak unless the welfare benefits meet or exceed the £600m of lost auction receipts. It is not clear to us what the incremental benefit is of having two identical geographical obligations rather than one, and it is certainly not clear that any such benefit equals or exceeds £300m. By the nature of services being mobile, all MNOs operate national retail pricing and hence as long as there is competition between several MNOs in most parts of the UK geography, citizens who live in parts of the UK only served by one operator should also see the benefits of such competition (although they may not have a choice of operators to subscribe to).

While 'always on' mobile services are highly prized, rural consumers recognise that full range of services cannot be available everywhere, all of the time⁶. However, Ofcom has placed significant emphasis upon providing consumers with data speeds of at least 2Mbps of data, provided at a signal strength of -105dBm or -95dBm, across all parts of the UK with no exception. Given Ofcom's proposals over-reach current mobile expectations, and at a significant cost, other ways of improving mobile coverage should be considered.

- 4.4 Given multi-layer, multi-frequency networks enable operators to provide a good mobile experience without necessarily providing a signal strength of -105 dBm or higher, Ofcom has failed to make a convincing case for designing the coverage obligations on the basis of -105 dBm and in the case of the indoor premises obligation, -95dBm so that it would cost, in the case of BT, up to or in excess of [£<] deliver the obligation.
- 4.5 We consider a signal strength of -115 dBm would enable consumers in rural locations to experience a minimum of 2Mbps outdoor service to a reasonable reliability.

⁶ Ofcom, 09 March 2017. *Improving Mobile Coverage: Proposals for coverage obligations in the award of 700MHz spectrum band (paragraph 2.11)*.
https://www.ofcom.org.uk/data/assets/pdf_file/0022/111937/consultation-700mhz-coverage-obligations.pdf

- 4.6 Indeed, delivering geographic coverage at -105dBm in rural areas encourages the over densification of sites (which is, for the reasons already provided, controversial and costly in rural communities) and over-indexation of mobile performance against consumer expectations; that could also lead to the situation where low population areas have significantly better mobile services than high population areas.
- 4.7 BT/EE urges Ofcom to reconsider the signal thresholds or undertake more thorough cost benefit analysis to justify the proposal including empirical evidence of consumer expectations not being met at signal levels lower than -95dBm or -105dBm respectively.
- 4.8 Ofcom's approach in respect of the premises obligation also requires further justification. Ofcom expects the obligation to be met within a £300m envelope. However, through overly stringent conditions of use, Ofcom precludes the provision of good indoor connectivity using more cost-effective technologies. It appears to us disproportionate to propose spending up to £300m of public funds on the basis of a desire to avoid mobile users having to input a WiFi password the first time they connect to a given network. While providing consumers with an optimal user experience when using mobile technology indoors is noble, the proposed premises obligation neither offers value for money nor considers the future of converged technologies. Assuming that the cost of meeting the premises obligation is £2,500/premise (simply calculated as £300m/120,000 premises), this is simply not cost effective given the availability of technology built into handsets that offers consumers the option to use a broadband connection to make phone calls and go online (i.e. WiFi Calling). WiFi Calling provides connectivity at no extra cost to the MNO, is available on a large number of devices and models available across a wide range of price points.
- 4.9 BT acknowledges that not all UK homes have broadband (although the latest Ofcom Connected nations report confirms that only some 925,000 (3%) of UK premises are unable to access at least a 10Mbps down and 1Mbps up service) and that not all customers want to take both a broadband and mobile connection. However, there is a large proportion of the population that do consider it very desirable to subscribe to both fixed and mobile services, which we believe (for the reasons below) will increase in the future. In Annex 3 we provide the results of analysis of BT Consumer fixed broadband customers located in the 100x100m pixels that are currently complete mobile not-spots according to data provided to us by Ofcom. That analysis shows that the vast majority of these premises areas with no indoor mobile coverage have existing fixed broadband available that could support the indoor coverage solutions outlined above.
- 4.10 Architectural features of UK homes mean that it is often more appropriate for consumers to have an internet connection straight to the home: modern planning law requires greater thermal efficiency and the use of building materials like wire mesh, concrete and limestone will mean that, regardless of signal strength, the consumer will always struggle with indoor coverage.
- 4.11 Increasing usage of low latency services such as IPTV, VoIP, video calling and online gaming will mean consumers may well prefer to use a fixed connection because it offers (on a per Gigabyte basis) a cheaper connectivity solution.
- 4.12 This leads to the conclusion that where there is the option of subscribing to a broadband connection, there is the opportunity to get indoor mobile voice and data coverage

without the need for an over specified mobile coverage obligation that requires substantial MNO investment.

- 4.13 In conclusion, we believe it is more proportionate to have a single geographic based obligation or a premises based obligation designed as an in-fill obligation, i.e. an obligation to provide good indoor coverage only aimed at premises where there is no broadband and no mobile service offering speeds of 2Mbps or more. This would enable communication providers to adopt a technology neutral approach to connectivity that supports innovation.

The cost of meeting the obligation will lead to difficult investment decisions that will affect the industry's ability to support infrastructure projects that support next generation mobile technology.

- 4.14 As described above, the welfare benefit of extended coverage does not appear to be proportionate to the significant infrastructure investment costs that will be incurred by the MNOs meeting the proposed obligations.

- 4.15 MNOs have limited resources (including skilled labour) available to deploy new sites and upgrade the network [§<].

The obligations risk undermining recent legislative reform designed to streamline infrastructure deployment.

- 4.16 As discussed at paragraphs 3.3 – 3.7, identifying appropriate sites for the deployment of infrastructure and the subsequent landlord negotiations can be lengthy and complex. Delivering infrastructure within three years will mean operators must factor in the risk of delivering sites based on uncommercial terms, thereby depriving operators of any of the financial benefits DCMS intended the new Electronic Communications Code to provide. It would therefore also lock in historic ransom rents for 10-15 years ahead. The alternative is to embark upon a broad programme of litigation under the new Electronic Communications Code, which is contrary to Ofcom's Code of Practice and which will be expensive and a material drain on court and tribunal resource, contributing to the timings and cost risks identified as fundamentally problematic with the designs of the proposed coverage obligations.

The cumulative effects of the proposed coverage obligations (as described in section 5) create significant cost and delivery risks for operators, that are exacerbated by the risk of a fine pursuant to s.54F of the Digital Economy Act 2017, which will lead to the risk of unsold spectrum.

- 4.17 The cost and delivery risks described in sections 2 and 3 of this response create significant uncertainty for operators and these are exacerbated by the prospect of a fine pursuant to s.54F of the Digital Economy Act 2017. Ofcom's powers to fine an MNO up to 10% of gross revenue, while effective in the context of encouraging MNOs to comply with licence conditions that are clearly achievable, act as a deterrent where it is less obvious that the conditions can be met. Operators must therefore assess whether there remains a positive business case for taking on the coverage obligations by reference to the market value of the spectrum, less deployment costs, less a risk of fine. Ofcom

proposes three obligations, at most two of which can be taken by the same operator. Within a three year period, the obligations cannot be met by anyone other than an existing MNO. Hence, there would need to be at least, and quite possibly three of the current four MNOs would be willing to accept one of the proposed coverage obligations. We believe there is a real risk that the coverage obligations as proposed by Ofcom coverage obligations are too stringent to generate sufficient MNO demand, leading to the risk of unsold spectrum.

5 An alternative approach

5.1 The outcomes described at section 4 are avoidable. There are possible alternatives that could better support expanded rural coverage.

More flexible coverage obligations:

5.2 If Ofcom is minded to pursue coverage obligations by way of a condition within the spectrum licence, the direct and indirect costs (i.e. risk of a fine) associated with meeting the obligations must be reduced. BT considers that it would be possible to do this in a number of ways, including:

- i. Relaxing the three-year implementation window. This would allow for a co-ordinated approach to network planning that accommodates short and longer-term government strategies to improve rural coverage and for the UK to lead in 5G, while maximizing the opportunity to ease the cost burdens faced by the operators by effective network sharing arrangements and encouraging joint site design. It would also accommodate for the time required to assemble a proper project plan and contract with the third-party specialists required to support MNO delivery (e.g. engineers, designers, riggers, planning, site acquisition agents and legal experts).
- ii. Imposing coverage obligations that are based upon a concept of “good mobile experience” that is sensitive to the rural context (rather than the signal levels Ofcom suggests) to reduce the risk of unnecessary investment in remote or low population density areas.
- iii. Splitting responsibility of the nation-based thresholds across two obligations to reduce the number of third parties interested in the deployment programme and reduce the number of planning regimes that an operator must engage with. This offers the benefit of concentrating the resources and the expertise required to deploy within a given region (i.e. provides an opportunity to benefit from economies of scale).
- iv. Specifying an EAS obligation separately which only commences once all EAS sites have been delivered. This would provide comfort that MNOs will not be responsible for funding any coverage shortfall by EAS and reduce the risk of a fine pursuant to the Digital Economy Act 2017 should delays with EAS deployment render compliance with the obligation implementation window unfeasible.
- v. Relaxing the premise based obligation, if retained, to permit the use of complementary technologies to provide required indoor coverage. Permitting operators to rely more easily on the use of broadband infrastructure would provide MNOs the opportunity to concentrate new mobile infrastructure in more targeted areas.

6 Auction considerations

Interplay of coverage obligations and auction design

- 6.1 BT/EE understands that Ofcom will consult later about the auction design and how any coverage obligations will be incorporated. Nevertheless, we would like to offer some preliminary comments at this early stage based on the information Ofcom has provided in the present consultation. We have a number of concerns which we detail further in Annex 4. These include:
- a. Assumptions about potential value of the spectrum relative to the costs of the obligations.
 - b. The distorting effect that the obligations may have on the auction prices for obligated and non-obligated lots, risking that the cost of the obligations is not transparent and is funded by increased prices for all winners and not just by foregone auction revenues.
 - c. The potential for inefficiencies in allocations and assignments depending on how the obligated lots are identified and assigned.
- 6.2 These concerns are most likely to manifest themselves in the event that Ofcom decides to associate obligations with specific block allocations before it consults on auction design. We look forward to engaging constructively with Ofcom prior to consultation on detailed auction proposals and provide within Annex 4 an initial suggestion as to one option that Ofcom might consider as to how the auction could be structured to avoid some of the concerns we identify. At this time, this is meant to illustrate our position that Ofcom should only decide at this time the obligations (if any) that it plans to impose on licensees rather than the precise mechanism it uses to impose them.
- 6.3 We suggest that for the eventual auction design Ofcom considers a scheme where the coverage obligations (and associated reduced prices) are sorted out in a second phase after the spectrum is all first assigned without obligations.

Annex 1 - Responses to the consultation Questions

Please see main body of the response for full answers to the consultation questions.

We briefly summarise our high level position on each question, and reference to the relevant sections of this document.

Q1: Do you agree with our proposal to include two geographic coverage obligations and a premises obligation in the 700MHz award?

We are supportive of suitably scoped geographic obligation(s) with appropriate coverage targets and timescales but we do not think having two identical coverage obligation represents value for money. If a geographical obligation was instead split into two, covering different geographical areas, it may be more feasible to deliver in a three year time frame. We believe a premises based coverage obligation should consider a more technology neutral and convergent approach to fixed and mobile networks and services.

See sections 2 – 5 for details.

Q2: Do you agree with our proposed target for geographic coverage?

The obligation is very onerous in terms of timescales, coverage percentage / signal level and the likely costs. This risks unsold spectrum or distorting the auction outcome and leading to high spectrum costs that could detract from network investments both in rural coverage and in urban areas, including 5G.

See sections 2 – 5 for details.

Q3: Do you agree with our proposed target for in premises coverage?

As proposed by Ofcom, the premises obligation risks being a disproportionate measure and leading to costs that exceed benefits. A more technology neutral approach based on the complementary role of fixed and mobile networks would achieve a better outcome.

See sections 2 – 5 for details.

Q4: Do you agree with our proposed approach to targets for the Nations?

We agree that different targets are appropriate to reflect the very different geographies in terms of unpopulated / very low population areas and terrain features.

Q5: Do you agree with our proposal that the coverage obligations should be met within 3 years of the 700MHz award?

No, we consider this period to be far too short, leading to increased implementation costs, disincentive to invest due to risks of failure to comply, and potential impact on other initiatives such as 5G investments. We believe a 5 year period may be feasible yet would still be challenging to deliver.

See section 3 for details.

Q6: Do you agree that sharing information on the location of new sites in rural areas in advance of submitting a planning notice would be appropriate?

We are sceptical as to the benefits.

See section 3 for details.

Q7: Do you have any other comments?

See Sections 1-6 and associated annexes.

Annex 2 - Utility Quotes (Confidential)

In the Table A2-1 below we provide some examples of the high costs that can arise when providing power to base station sites in remote locations. This illustrates one of the factors as to why some sites can be extremely expensive to build and forms part of the risk that would exist if accepting coverage obligations (in addition to others issues such as backhaul availability, wayleaves and planning aspects).

Table A2-1: Examples of cost of providing power to remote base station sites

Site Name	REC Name	Firm Quote Issued	Cost
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Annex 3 - Broadband coverage supporting mobile not spots

BT has analysed the mobile not spot data that Ofcom supplied and estimated what fixed broadband speeds might be available to these premises (see figure below).

This analysis suggests that there are currently c. 400k premises in these mobile not spots. We understand Ofcom arrived at c 200,000 when considering just those in rural areas and after including some projection of fewer mobile not spots by June 2019.

Looking at BT Consumer data, we analysed the line speeds of [redacted] existing customers located within the existing mobile not spots and found that [redacted] have downlink speeds of better than 10Mbit/s (and could if taking a different product receive better than [redacted]).

[redacted - figure redacted]

Ofcom should take the opportunity to consider whether, given the fact that well over [redacted] of the 200,000 mobile not spot premises already can receive good broadband, as well as the likely existence of the planned fixed USO for those that do not, the indoor coverage obligation (if delivered by outdoor mobile base stations) offers value for money from a public spending perspective? Ofcom implies within the consultation that the auction could support a cost of £300m for this obligation. That equates to £2.5k for each covered premise. Furthermore, if as Ofcom mentions, the 92% Geographic obligation equates to coverage of 90% of the rural land mass, the chances are that 60% of these 200,000 rural premises will anyway receive good outdoor coverage twice over by the other two geographic obligations.

Annex 4: Auction design considerations

Interplay of coverage obligations and auction design

BT/EE believes that at this time Ofcom should decide only on whether it intends to require an obligation to one or more winning bidders of spectrum in the 700 MHz and 3.6 GHz auction. It should not designate specific numbers of blocks of spectrum to specific obligations, such as 2x5MHz as indicated in the present consultation. Rather, Ofcom should leave those decisions to its consultation on auction design. This would allow Ofcom, and potential auction participants, sufficient time to consider the most efficient manner in which to implement those obligations within the overall dynamic of the auction. Should Ofcom instead tie specific quantities and/or frequencies of spectrum to specific obligations, it risks encouraging a specific auction dynamic or auction outcome before it has even consulted on the auction design. As we explain below, this could have any number of unintended consequences and inject inefficiencies into the market.

Should Ofcom tie specific blocks to one or more coverage obligations it is potentially risking several forms of unintended consequences:

1. It is forcing an auction allocation before consulting on an auction design
2. It is forcing (potentially) assignment before consulting on an auction design
3. It is forcing (potentially) an auction dynamic before consulting on an auction design
4. Ofcom could be affecting competition for blocks without obligations

We explain these items as follows:

Ofcom is forcing an auction allocation before consulting on an auction design. The two types of obligations that Ofcom is considering are (1) based on geographic coverage and this obligation would be assigned to two paired 5MHz blocks and (2) based on indoor premises coverage and this would be assigned to one paired 5MHz block. Ofcom seems to have not adequately considered the implications given that these two obligations are likely correlated. That is, the participant that can provide a geographical obligation at the lowest cost could potentially provide the indoor premises obligation at the lowest cost. As a result, Ofcom could be directing much of the spectrum at auction to one participant before even consulting on the auction design.

Ofcom is forcing (potentially) assignment of frequency before consulting on the auction design. In 2013, Ofcom implemented a coverage obligation by tying that obligation to specific frequencies in the 800 MHz band. Presumably, Ofcom may intend to follow similar practice. With (potentially) 50 percent of paired blocks having obligations and therefore assignments pre-auction, Ofcom could be completely bypassing the assignment phase of the auction in 700 MHz. This would happen if one participant won a block with a premises coverage obligation and a block with no obligation. With a contiguity rule in assignment, the remaining two blocks without obligation would be in a specific 2x10 MHz frequency range. The problem with this is that Ofcom would have made an assumption that specific frequencies are suited to meeting specific obligations rather than simply letting the market decide. As a result, Ofcom could err in its decision and, consequently, create obligations that are more expensive to provide than they would be otherwise.

Ofcom is forcing (potentially) an auction dynamic before even consulting on the auction design. Specifically, should Ofcom tie obligations to specific quantities and frequencies of blocks, it may limit the design of the auction that it could administer. Specifically, Ofcom would almost certainly be required to include separate product categories within the 700 MHz band in any auction it decided to

implement. To see the complications involved in this, Ofcom should look no further than the 2013 LTE auction it conducted. That auction included two product categories in 800 MHz and four product categories in 2.6 GHz. Although many factors affected the competition in that auction, a key factor was the number of different product categories. Ofcom should consider prior auctions it has conducted and seek to simplify its auctions rather than over-complicate them.

Finally, and potentially most importantly, by assigning obligations to specific block quantities (i.e. 2x5MHz) now, Ofcom could undermine competition on blocks without obligations before it even consults on the auction mechanism. To see this, consider a feasible allocation stemming from Ofcom’s proposal to designate two blocks to one type of obligation and a third block to a second type of obligation. One participant could win a geographic coverage obligation block and an unobligated block and a second bidder could win the premises coverage block plus another block with geographic obligation. This would leave two blocks without obligations remaining to be split among two remaining mobile network operators. So either one operator could win both blocks or two operators could win one block each. The two allocations are illustrated below:

Auction Participant	700 MHz FDD Allocation 1	700 MHz FDD Allocation 2
Bidder 1	2x10 MHz geographic coverage block and a no obligations block	2x10 MHz geographic coverage block and a no obligations block
Bidder 2	2x10 MHz geographic coverage block and premises coverage block	2x10 MHz geographic coverage block and premises coverage block
Bidder 3	2x10 MHz no obligations	2x5 MHz no obligations
Bidder 4	0	2x5 MHz no obligations

NOTE: We do not represent these are the *only* feasible allocations, just two possible and presumably reasonable allocations.

By assigning obligations to specific allocation amounts, the competition in the auction could involve first determining who wins blocks with the obligations (assuming those blocks are subsidized sufficiently so that bidders want them).⁷ Once this has been established, and while Bidder 1 is still competing with Bidders 3 and 4 for the no obligation blocks, Bidders 3 and 4 have very strong incentive quickly to reduce demand from 2 blocks to 1 block to stop price from rising further. The reason is that if Allocation 2 holds, Bidders 3 and 4 will have *the highest priced allocations of 700 MHz spectrum in the auction while winning the smallest quantity*. Winning less and paying more is a very undesirable result. Consequently, Bidders 3 and 4 would have incentive to accept Allocation 2 simply to keep price low rather than bid in an attempt at achieving Allocation 1.

The end result, is that Ofcom will have uncovered a fair price for blocks with obligations, but it will have conducted an auction that *undervalues the price of blocks without obligations*. Put differently, the price gap between blocks with obligations and without obligations will be too small because a reasonably efficient auction for clean blocks never took place. It also warrants mention that to an

⁷ Should Ofcom conduct an SMRA or a uniform price clock auction (similar in nature to its auction for 2.3 GHz and 3.4 GHz spectrum in March to April 2018) and should the opening bid prices be such that the obligated blocks were attractive to multiple bidders at those prices, this dynamic could play out with reasonable likelihood. The reason is that in an ascending priced auction, the “drop-out” points for bidders would first be crossed on licences with lowest intrinsic values. These are the blocks with geographic coverage or premises coverage obligations.

uneducated observer the auction result outlined above would appear to be competitive and would appear to provide for a very small subsidy necessary to meet the obligations. This, however, is wrong. Because the auction under-priced the blocks without obligations, it under-valued the true cost of the subsidy necessary to provide the obligations.

BT hopes that, based on the logic above and its own judgement, Ofcom decides only at this time to rule on whether it should have certain obligations applied to any successful participant(s). For example, Ofcom could decide whether it will incorporate into its auction design certain obligations tied to certain successful participants for spectrum in the 700 MHz band. It does not need to tie those obligations to specific block amounts and specific frequencies in 700 MHz. Those decisions can be made within the context of the auction consultation process, which would allow participants the opportunity to comment on the obligations within the context of the overall auction design.

For example, consider the following alternative scenario, which may be preferable:

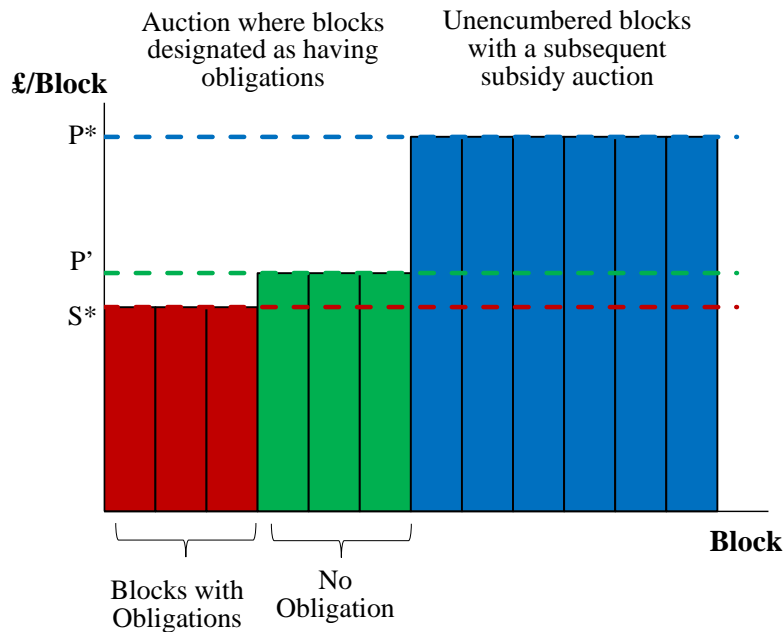
- Ofcom determines now the obligation or obligations that are to be applied to 700 MHz licensees.
- For simplicity, assume Ofcom decides that a geographic coverage and the premises coverage obligations will be served by one winning bidder of 700 MHz FDD spectrum.
- Ofcom conducts the principal and assignment stages of the auction for 700 MHz and 3.6 GHz spectrum as though no blocks contained obligations.
- After this “forward” auction is concluded, all bidders winning 700 MHz FDD are then allowed to compete for a subsidy in a “reverse” auction to provide the geographic coverage and/or premises coverage obligation.

This could have the following advantages:

- Ofcom would be far more likely to uncover the fair market price for 700 MHz FDD;
- Ofcom would be far more likely to minimize the costs of the coverage obligation and would more accurately uncover the true cost of that obligation; and
- The auction would result in an efficient allocation with higher likelihood.

By first conducting an auction for 700 MHz FDD without obligations, Ofcom can be assured that strategic gaming doesn’t reduce competition for blocks without obligations as bidders fear winning less but paying more. Rather, a uniform price for 700 MHz FDD without obligations would first be established.

To see that the cost of the obligations would be minimised in a two stage process that separated a subsidy auction from spectrum auction, consider that before bidding to provide the obligations, bidders would know their allocations and assignments *of all spectrum*. Perhaps some obligations are easier to meet with specific frequencies of 700 MHz FDD. Or perhaps the obligations are more efficiently provided with combinations of 700 MHz FDD and TDD and other spectrum licenses already held. By allowing for this dynamic, Ofcom would allow for greater efficiency in meeting its obligations than it would otherwise. But again, such decisions should be made within the context of the auction design consultation. And by designating specific blocks to specific obligation(s) now, Ofcom would forgo the chance to include such analysis into its decision-making.



The figure above illustrates the pricing of blocks under two separate scenarios. In the first, 3 of 6 blocks are designated as blocks associated with either a geographic coverage or a premises coverage obligation. These blocks are priced in the auction at a price per block of S^* . Under many auction mechanisms, S^* would reflect the point at which cost of providing the obligation(s) plus the cost of the spectrum (S^*) is just equal to the value of the spectrum for the first bidder that loses the opportunity to serve the obligation.

Bidders realising they are on the losing end of the obligation blocks, will shift bidding to the blocks without obligations, where incentive will be to end the auction quickly rather than risk winning 2x5 MHz and paying a higher price-per-block for it (P').

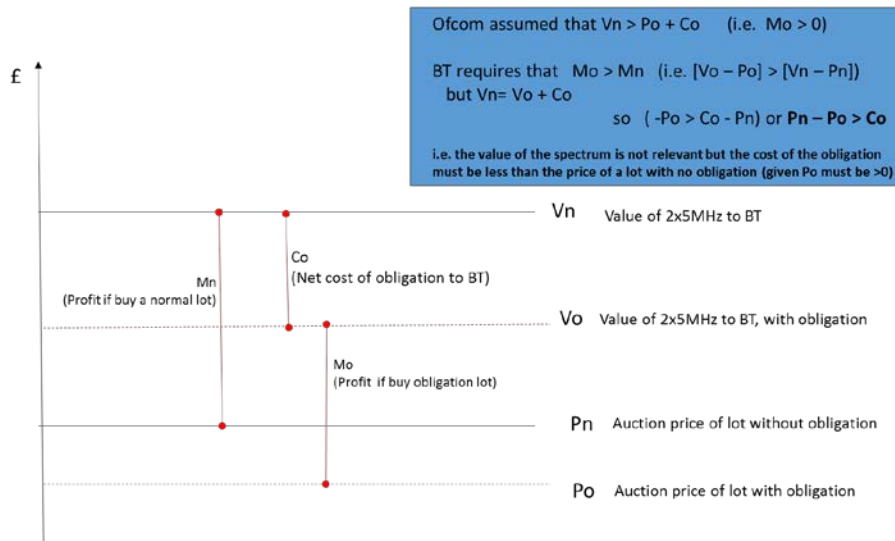
By contrast, if blocks are initially let at auction as unencumbered, bidders could have more incentive to reveal bid prices closer to intrinsic value of the spectrum. As a result, the auction could reveal price of (for example) P^* rather than P' for unencumbered blocks. A secondary auction could then determine the amount of the subsidy, which, in this diagram would be $P^* - S^*$ per block.

Put simply, Ofcom could potentially conduct a relatively efficient process by first establishing the market value for unencumbered spectrum and then conducting a secondary auction (similar to an assignment round structure) to determine the bidder that provides obligations and the subsidy necessary for those obligations. To do this correctly Ofcom would need to avoid designating a specific number of blocks toward obligations at this time. Presently, Ofcom would be wise to determine only whether obligations are required (and if so what those obligations should be). Ofcom can then consult on the best manner in which to implement obligations (if any) within the overall auction design at a more appropriate time.

Ofcom’s estimate of what level of coverage obligation costs can be supported by the auction

Ofcom indicates at para 3.26 that “we can only expect an operator to acquire spectrum with a coverage obligation if its valuation of the spectrum, less the price it has to pay for the spectrum, is greater than the net cost of meeting the coverage obligation”

We do not agree with this premise because there are other unencumbered lots available in the auction and what is therefore more relevant is whether the net cost of the coverage obligation is less than the market clearing price of the spectrum of the auction lots that do not have a coverage obligation attached. It is not particularly relevant, in the context where there are other lots available without obligations, whether the net cost of the coverage obligation plus the price it has to pay is less than its valuation of the spectrum. See figure below.



Ofcom appears to assume that the coverage obligation cost limit that could be supported without leading to unsold spectrum is £300m. This figure is close to the market value of the adjacent 800MHz band revealed in the 2013 UK auction and somewhat in excess of auction prices (when scaled to the UK scenario) seen in other markets (e.g. 700MHz in Germany, 2016). It is therefore far from certain, even if the costs of the coverage obligations were £300m or less, that the UK 700MHz auction could support such obligations rather than leaving unsold spectrum.

There is also a small risk that the obligations will lead to higher spectrum prices for all participants and this could detract from ability to invest in network. The unencumbered lots could be more costly if operators focus their bids on these in order to avoid large costs and risks associated with the obligations, potentially leading to both high spectrum prices and unsold spectrum. This scenario is perhaps unlikely but could arise in a situation where Ofcom had dramatically underestimated the costs of delivering the obligations.

Offices worldwide

© British Telecommunications plc 2017
Registered office: 81 Newgate Street, London EC1A 7AJ
Registered in England No: 1800000

