T-Mobile's response to Ofcom's consultation on the application of spectrum liberalisation and trading to the mobile sector

T-Mobile welcomes the opportunity to respond to Ofcom's consultation, *Application of spectrum liberalisation and trading to the mobile sector*, released on 20 September 2007.

T-Mobile notes that mobile spectrum liberalisation carries the potential for substantial consumer benefits but also risks serious harm to competition in the UK mobile market depending on how liberalisation is carried out. As such, T-Mobile welcomes Ofcom's thorough evaluation of the advantages and disadvantages of the key options in relation to mobile spectrum liberalisation. T-Mobile's technical experts share Ofcom's view of the large cost savings that can be realised through enabling 3G services to be supplied at 900 MHz rather than at 1800 MHz or 2.1 GHz. Fundamentally, these cost savings arise from propagation properties that derive from the laws of physics. The cost savings offer the potential for lower priced services and improve the viability of extending 3G coverage.

The extent to which consumers benefit from UMTS 900 will depend on whether operators face sufficient competitive pressure to pass-through cost savings and compete over coverage and service innovation and quality. International and UK evidence on the development of mobile markets suggests that restricting 900 MHz spectrum to only 2 operators will not be effective in ensuring that cost savings are passed through. Moreover, there is a large risk that competition in the overall market will be harmed if 2 players receive a substantial competitive advantage compared with others including in relation to costs, indoor and outdoor coverage, speed of rollout and quality of service. If overall competition is harmed, consumers could perversely be made worse off from refarming. Other spectrum becoming available in the medium term, or alternative policy measures, are not an effective substitute for access to 900 MHz spectrum. While T-Mobile agrees with Ofcom that reassignment of some 900 MHz spectrum will best promote competition and overall efficiency, we note that some of Ofcom's assumptions are conservative so that Ofcom's modelling may understate the benefits of reassignment in practice.

In summary, T-Mobile supports:

- 3 blocks of 900MHz spectrum being re-assigned in 2010 either by an auction or a beauty contest (subject to whichever one would carry lower costs given that the released spectrum is highly likely to go to the existing operators without 900 MHz spectrum);
- the existing 900 MHz operators should be restricted from bidding for the re-awarded spectrum so as to ensure that competition and efficiency are promoted by the reassignment;
- the minimum term of the allocated licences should be 20 years in line with mobile-network investment pay-back periods;
- the existing 900 MHz operators should also be restricted from refarming their spectrum prior to the spectrum reassignment and their spectrum should be subject to same terms and conditions (including the same price per MHz) as apply to the reassigned spectrum to ensure competitive neutrality; and
- the existing wide distribution of 1800 MHz spectrum should be maintained and this spectrum should be liberalised in 2008 or 2009 with a perpetual licence term subject to 5 years notice for spectrum replanning purposes.

Further T-Mobile argues that the issue of liberalisation needs to have been resolved prior to the 2.6GHz spectrum auction. Without this resolution it will be difficult for parties to determine their requirements in that auction.

Response to consultation questions

Question 1.1 Do you have any other comments on this consultation document in addition to those made in response to the questions set out below?

We note that the boundaries of both the 900 MHz and 1800 MHz spectrum could possibly be subject to additional constraints to protect adjacent services. We would welcome clarification of any additional constraints for each boundary.[1] Any additional constraints could give rise to problems for the new players who, having less spectrum than Vodafone and O2, will have difficulty in implementing new (i.e non GSM) technology into their spectrum. Careful consideration is therefore required into which part of the spectrum is released. For example, taking the case of the GSM 900 block that borders the GSM Railway allocation (GSM-R), although according to the consultation is this is lightly used, it may not be appropriate for the new players as the GSM-R operators always seek high levels of protection.

We also note that there appears to be an error in Table 2 which indicates that Vodafone and O2 each have 2 × 17.2 MHz of 900MHz spectrum. Elsewhere their current 900 MHz spectrum holdings are reported as 2 x 17.4 MHz each. For instance, see the ERO Information document on "GSM Frequency Utilisation within Europe (Updated: July 2007)" and the information contained in the Annex 9 to this consultation (for example Table 41).

T-Mobile recognises that Vodafone and O2 will face costs to release spectrum. We believe that either some proceeds from the auction or the spectrum efficiency fund should be used to encourage a smooth and speedy release.

We support the comments on the potential use of the Digital Dividend Review (DDR) spectrum. In common with other operators (and we welcome and acknowledge the major contribution from Ofcom) we are working to harmonise spectrum in the band for mobile use. However, T-Mobile would observe that it has taken 7 years for harmonisation of the 2.6 GHz band and equipment specifications within 3GPP and ETSI to be agreed. It is likely to take a similar time to get equipment for DDR spectrum. It follows that the DDR spectrum will not provide existing operators with a valid substitute to 3G at 900MHz.

As an 1800 MHz only operator for 2G we have previously been disadvantaged by the late introduction of features compared to 900 MHz operators who have had the benefit of larger economies of scale. We agree with Ofcom's view that this is likely to be replicated in relation to the use of 3G in the lower frequency bands. This view also appears to be supported by documents from the GSM Association and Global Mobile Suppliers Association who concentrate on UMTS 900. This further supports the case for reallocating some of the existing 900 MHz spectrum.

From a UK market perspective it is commonly recognised that fostering growth of mobile data within a healthy, competitive, market environment is critical to the continued stability and development of the domestic mobile market. With the continued erosion of voice revenues increasing emphasis is being placed upon data as a means of maintaining current revenue levels.

Annex 4 provides an overview of the anticipated growth in mobile data, the services expected to drive this growth, current take up rates as well as identifying the key determinants of strong mobile data growth. In summary these are ease of use, cost control, affordability and reliability of service experience.

Only in a strong, competitive, national mobile data market environment will the accelerated removal of these barriers to adoption occur and the benefits derived from technology advances and commercial competition be passed onto the consumer.

[1] We note that the 880/925 MHz boundary is shared with GSM-R and 960 MHz with Radars and that this has caused some disagreements between interested parties in CEPT discussions.

Question 3.1 Do you have any comments on Ofcom's interpretation of its obligations under the forthcoming RSC Decision?

T-Mobile shares Ofcom's view of its legal obligations relevant to its spectrum refarming proposal. The RSC Decision is clearly aimed at ensuring that current 2G spectrum is made available for 2G and 3G use and the UK is required to implement the Decision. In particular we note recital 16 to the RSC Decision which states:

> "Differences in the national legacy situations could result in competitive distortions. The existing regulatory framework gives Member States the tools to deal with these problems in a proportionate, non-discriminatory and objective manner, subject to Community law including the Authorisation Directive and the Framework Directive".

Further, Ofcom is required to carry out it functions so as to secure the optimal use of the electro-magnetic spectrum and having regard to, among other matters, the desirability of promoting competition.

T-Mobile recognises that the decision to not renew a spectrum licence is a serious matter. However, spectrum policy in most countries recognises that licences may need to be varied or revoked for spectrum management reasons and/or to comply with international obligations. As Ofcom has identified, these provisions are included in the current 2G licences and in the Wireless Telegraphy Act 2006 and represent part of the known legal framework for operators. As we discuss further below, Ofcom's proposals can be expected to bring large economic benefits to the UK including by promoting both the efficient use of spectrum and effective competition. In these exceptional circumstances, Ofcom's decision not to renew spectrum licences is consistent with its duties and the interests of consumers.

T-Mobile also considers that the legitimate expectations of operators arising from the 3G auction Information Memorandum are relevant in the context of refarming:

> "the Government would expect to take account of potential effects on the viability of existing 2G and 3G operators and of the case for rectifying any distortions in the market caused by historic assignments"[2]

Thus the Government clearly established the expectation that refarming policy would be developed with due regard to maintaining the viability of existing operators and the desirability of rectifying the distortions created by the assignment of spectrum in the past. As Ofcom's analysis in the consultation document establishes, these considerations provide a strong case for reassigning 900 MHz spectrum.

Question 5.1 Do you agree that the 900 MHz spectrum is likely to provide a cost advantage over higher frequencies for the provision of mobile broadband services? If so, do you believe that Ofcom's estimates of the size of that cost advantage are representative of what would realised in practice?
Question 5.2 Do you agree that the 1800 MHz spectrum is unlikely in practice to provide a cost advantage over higher frequencies for the provision of mobile broadband services?

T-Mobile considers that the cost savings from the use of 3G at 900 MHz are likely to be at least as high as Ofcom's estimates. T-Mobile also agrees with Ofcom's view that 3G at 1800 MHz is likely to generate negligible cost savings compared with 3G at 2.1 GHz once higher equipment and handset costs are taken into account.

- Ofcom has estimated that access to 900 MHz spectrum could mean that in the order of 13,000 fewer sites could be deployed per operator (across densely populated and rural areas) while giving the same quality of service compared with 2.1 GHz. The estimated resulting cost savings are in the order of £1.95bn per operator over a 20 year period in present value terms. Large cost savings (in the order of 10% of overall costs for a

[2] *3G Information Memorandum*, 1 November 1999, p.38.

European operator) from the use of 3G at 900 MHz have also been estimated by Ovum.[3] These cost savings represent a large efficiency gain to the economy as a whole.

- In contrast, Ofcom has estimated that the cost savings from 3G at 1800 MHz compared with 3G at 2.1 GHz are much smaller and that in practice there may be no savings given that equipment and handsets for 3G at 1800 MHz may not have sufficient scale to keep costs down.

The implication of these findings is that 3G at 900 MHz will deliver a large cost advantage compared with 3G at 1800 MHz. In particular, Ofcom has estimated that the 900 MHz advantage, compared with 1800MHz, could be in the order of 7400 sites or £1.43bn (and significantly higher were demand to turn out higher than under Ofcom's central, but relatively conservative, demand assumption). This difference in costs would represent a loss to the economy were an operator forced to supply 3G at 1800MHz rather than at 900MHz.

In addition to the large cost savings, 3G at 900MHz gives rise to considerable further economic and social benefits. In particular, the need for significantly fewer sites including faster rollout and reduced environmental impact represent substantial advantages that would not be realised absent a reallocation of 900MHz spectrum.

Question 6.1 Do you agree that if the existing distribution of the 900 MHz spectrum continued post liberalisation, this would be unlikely to promote competition for the provision of mobile broadband services?

T-Mobile agrees that the propagation differences between 3G at 900 MHz and at 1800 MHz would imply a large risk of harm to competition if the current unbalanced distribution of 900 MHz spectrum were retained post liberalisation. Significant harm to competition would result from operators with access to 900 MHz being given substantial commercial advantages from liberalisation over operators with only 1800 MHz or higher spectrum including:

- *Savings on site costs* - Ofcom has estimated in its medium scenario that a 900 MHz operator would enjoy a cost saving of £0.7bn compared with an 1800 MHz operator for coverage in densely populated areas alone (measured using operators' discount rates which are key for pricing). ✂.
- *Much better indoor and outdoor coverage* - ✂. Differences in in-building coverage will also lead to differences in the ability to offer fixed-to-mobile substitution products impacting on the competitiveness of the overall telecoms sector as well as further affecting competition within the mobile market.
- *Improved customer experience* - fewer cells would lead to a better quality of service through lower dropped calls at handover.
- *Lower cost and greater availability of network equipment and handsets* - the first commercial 900 MHz 3G networks are expected to be rolled out at the end of 2007 or early 2008 while plans for network equipment or handsets for 3G at 1800 MHz are undeveloped suggesting long delays and, even when they become available, they are likely to more highly priced than for 900 MHz because of the much more limited scale of production.

These advantages highlight the benefits that can be generated by 3G at 900 MHz. However, for consumers to fully realise these benefits it will require an effectively competitive market. Only with viable competition from the current 1800MHz only operators will refarming result in cost savings being passed through to consumers and create an incentive for operators to expand coverage and introduce innovative new services.

Hence, if access to 900 MHz spectrum were limited to only two operators, *at best* it would significantly limit the extent of consumer benefits. The operators without 900 MHz spectrum would not be able to compete effectively. In these circumstances, they would have no ability to drive prices lower. Competition would therefore be limited to the interaction of the two 900 MHz operators. However, numerous econometric studies have found that 2 player

[3] Ovum, *Market study for UMTS900,* February 2007, p.9.

mobile markets are highly unlikely to deliver effectively competitive outcomes.[4] Further, the Article 7 reviews by national regulators of the competitiveness of their national markets for mobile access and outgoing calls found that the presence of only 2 operators (and even in some cases 3 operators) is not sufficient to achieve effectively competitive outcomes.[5] These findings are consistent with the UK experience in which it was only with the development of the networks of the third and fourth mobile players in the mid to late 1990s that mobile prices fell substantially, thereby spurring the growth of the overall market. It follows that reallocation of 900MHz spectrum is essential to ensuring continued and increasing competition in the long-term.

Indeed, retaining the current distribution of 900 MHz spectrum may not simply fail to promote competition but risks seriously reducing the existing level of competition. The UK mobile market is the only European mobile market with five operators remaining[6] and cases such as the Netherlands show that a market can consolidate from five to three operators within 2 years. In this context, a policy that effectively and significantly handicaps three of the existing operators carries a serious risk of precipitating consolidation and the loss of competition. ✂. Either way, the ultimate consequence will be a less competitive UK mobile market.

We also note that other spectrum becoming available will not provide a good substitute for access to 900 MHz spectrum. The 2.6 GHz spectrum is at an even higher frequency than the existing 3G spectrum, while the Digital Dividend spectrum:

- has significant constraints for mobile services due to international obligations;
- will not be available in the UK nationally until 2012;
- is not harmonised or standardised for mobile (work is ongoing internationally to provide a non-mandatory harmonised band plan, however, there are still great uncertainties whether any band plan developed will be compatible with the spectrum being released by Ofcom); and
- does not currently have large scale vendor support and hence the penetration of terminals across Europe is uncertain.

Finally, we note that there are a number of uncertainties surrounding the future development of the UK mobile market. Significant policy decisions can have long-lasting impacts on the structure of the market. Accordingly, such decisions must be founded on concrete evidence so far as possible. The possibility of future spectrum auctions providing substitutable spectrum, in which existing operators may or may not be successful in acquiring spectrum is therefore insufficient. T-Mobile would be concerned if a significant policy decision were to be unduly influenced by possibilities of changes in the market structure which may be highly uncertain.

Question 6.2 Do you agree that if the existing distribution of the 900 MHz spectrum continued post liberalisation, this would be unlikely to secure optimal use of the radio spectrum?

T-Mobile agrees that retaining the current distribution of the 900 MHz spectrum would not secure optimal use of the spectrum. As Ofcom notes retaining the current distribution would be likely to result in substantially higher overall costs (as the other operators are forced to invest in additional sites given the significance of 3G data quality) but a similar quality of service as would be achieved at much lower cost with a redistribution of spectrum. While Ofcom has estimated the additional costs of being restricted to use of 1800MHz spectrum as being in the order of £1.43bn per operator (or £4bn for the UK) ✂. This analysis also ignores the substantial delay that would arise before 3G could be introduced by 1800MHz operators.

---

[4] For instance, see P.M. Parker and L.-H. Roller, 1997. "Collusive Conduct in Duopolies: Multimarket Contact and Cross-Ownership in the Mobile Telephone Industry." *RAND Journal of Economics* 28: 304-322 and H. Koski and T. Kretschmer, 2005, "Entry, Standards and Competition: Firm Strategies and the Diffusion of Mobile Telephony." *Review of Industrial Organization* 26, pp.89-113.

[5] European Commission, *Article 7 Competition/ Regulation First Round Overview Table*, 26 July 2007.

[6] See the European Commission, 12th Implementation Report, Annex A, p.18.

The large overall cost savings from the reassignment of 900MHz spectrum reflect the facts that:

- Vodafone and O2 can still get the main benefit from 3G at 900 MHz with the 900 MHz spectrum that they would retain under Ofcom's proposal; while
- the additional 900MHz spectrum would generate greater economic value by being assigned to the other operators than by making the holdings of Vodafone and O2 even larger - in particular, the small incremental cost savings arising to Vodafone and O2 from having even more 900 MHz spectrum would be substantially outweighed by the additional costs that would be imposed on the other operators from being denied 5 MHz each of the spectrum.

The evidence does demonstrate that operators would need to minimise any quality disadvantage or face a large loss in customers over time. ✂. Even in a 2G world, the Competition Commission's 2003 customer survey found that quality of network service was the most important factor in choosing between operators (ranked in importance at 84%) and closely followed by geographic network coverage (61%). Inferior coverage can have a substantial and long-lasting effect ✂. Comprehensive driver analysis by independent research agency SPA has identified Network Performance as the primary driver for overall Customer Satisfaction in both Pay Monthly and Prepay markets outweighing the likes of Value and Customer Service. Moreover, for 3G services, speed is even more critical for downloading content successfully and quickly and hence the importance of coverage will even increase.

If operators without 900 MHz spectrum were unable to achieve the same level of coverage and quality of service as the 900 MHz operators then the use of spectrum would also be suboptimal as some customers would unnecessary suffer from inferior coverage and service quality compared with the outcome where the 900 MHz spectrum was optimally assigned. To the extent that similar levels of coverage and quality could be achieved (although this is doubtful, particularly in-building), then competition from 1800MHz operators would be significantly hampered by the time taken to roll out 3G services in the medium-term. As with 2G, the incumbent 900MHz operators would also benefit in the long-term from a reinforced consumer perception of superior network performance.

Questions 6.3 and 6.4 - Do you agree that if the existing distribution of the 1800 MHz spectrum continued post liberalisation, this would be likely to promote competition for the provision of mobile broadband services? Do you agree that if the existing distribution of the 1800 MHz spectrum continued post liberalisation, this would be likely to secure optimal use of the radio spectrum?

T-Mobile agrees that it is unlikely that there would be any material competition benefits or broader economic benefits from reassigning the 1800 MHz spectrum and certainly none to justify the costs of doing so. This is particularly the case given that 1800 MHz spectrum and 2.1 GHz spectrum is already widely distributed across operators and that differences in the amount of this spectrum held by operators are of little relevance as there are negligible cost differences between these bands (particularly after taking into account equipment costs - see the response to question 5.2 above). ✂. Further, given the current wide distribution of 1800 MHz spectrum, current rights to use 1800 MHz spectrum do not confer any significant competitive advantage on the rights holders. As such, there is no reason to believe that spectrum trading will not operate to ensure the optimal use of this spectrum, or would be required at all in order to preserve competition.

Access to greater 1800 MHz spectrum for the 900 MHz operators is also unnecessary to accommodate the release of some of their spectrum given the existence of Synthesised Frequency Hopping and the 3G capacity at 2.1 GHz. It should be noted that while T-Mobile and Orange have access to a larger than average share of 1800 MHz spectrum, under Ofcom's proposals Vodafone and O2 would retain larger shares of the much more valuable 900 MHz spectrum. Similarly H3G already has more 3G capacity than most other operators and would be equally

capable of securing 900 MHz spectrum to complement its existing holdings with lower frequency spectrum and the benefits this confers (which benefits are considerably greater than those at 1800 MHz).

In short, re-assignment of 1800 MHz spectrum would carry costs but little benefit. It is 3G at 900MHz that delivers significant advantages over current assignments.

Question 8.1 Do you agree with Ofcom's assessment of the merits of Option A (Liberalisation in the hands of the incumbents) for the implementation of the RSC Decision in respect of the 900 MHz spectrum?

T-Mobile has stated, in response to question 6.1, its serious concern is that retaining the current distribution of 900 MHz spectrum post liberalisation will not only fail to promote competition but would risk significantly reducing the current level of competition. Here we note that we share Ofcom's view that there are no alternative measures to a mandatory reassignment of some 900 MHz spectrum that would adequately protect competition or promote optimal use of the spectrum.

T-Mobile agrees that Vodafone and O2 cannot be expected to willingly give up the substantial competitive advantage derived from their exclusive control of 900 MHz spectrum. Liberalisation of 900 MHz spectrum would give Vodafone and O2 the opportunity to earn supra-normal profits arising from the difference between their costs using 900 MHz spectrum and those of other operators who have access to only much higher frequency spectrum. No other operator would be expected to pay a price for some of that 900 MHz spectrum that would compensate Vodafone or O2 for the loss of this profit. In particular, once 900 MHz spectrum is more evenly distributed across operators, competition would result in the supernormal profit being dissipated as market prices are driven down to the low level of costs of the 900 MHz operators to the benefit of consumers and at the expense of the industry.

T-Mobile also considers that there is little risk of either Vodafone or O2 deciding to sell some of their 900 MHz spectrum on the assumption that if they did not, the other one would and that they would thus lose some of the competitive advantage of the 900 MHz anyway but without gaining adequate compensation for duopoly profits from a sale. In particular it should be noted that Vodafone and O2 would soon be aware if the other one were to sell rights to some of its 900 MHz spectrum. A sale would soon precipitate further sales (and/or other competitive reactions) as the value of seeking to avoid competition would then be diminished relative to the value of selling spectrum to an operator for whom it would enable large cost savings. Being aware of the likely ultimate outcome, Vodafone and O2 would be expected to demand the present value of their share of the expected flow of super-normal profits before giving up any 900 MHz spectrum to another operator. However, no other operator would be prepared to pay this amount as they cannot expect to earn this, or even any significant, super-normal profit given the likely ultimate consequence of a return to effective competition in the market should one operator sell some spectrum. With little incentive for Vodafone and O2 to sell and every incentive to retain their 900 MHz spectrum, the other operators would be effectively locked out with harmful consequences for competition in the market.

The predictions of theory are also borne out by T-Mobile's experience to date – T-Mobile has been unsuccessful in obtaining any 900 MHz spectrum despite repeated approaches to Vodafone and O2. Both have made it clear that money alone would not be sufficient to compensate for loss of this valued asset.

T-Mobile also considers that a commercial roaming service would fail to promote competition and the optimal use of the spectrum compared with reassigning the 900 MHz spectrum. In particular, Vodafone and O2 cannot be expected to offer roaming on terms and conditions that would allow the other operators to compete effectively because to do so would result in the loss of the supra-normal profit that they could derive from exclusive rights to the 900 MHz spectrum. In the absence of access to competitive roaming services at cost-based prices, the other operators would be expected to lose their competitive position relative to Vodafone and O2 who would be in a position to offer either slightly cheaper services or better quality services which the other operators would not be able to match because of their reliance on roaming. Given these factors, reliance on a commercial roaming service would harm competition and may also lead to sub-optimal use of the spectrum if the other operators instead sought to roll out their 3G networks based on higher frequency spectrum more extensively.

T-Mobile agrees that Administered Incentive Pricing would also fail to lead to a redistribution of 900 MHz spectrum for the similar reasons as to why spectrum trading would be ineffective (see above).

Finally, network sharing would not adequately remedy the competition problem that would arise were the current distribution of 900 MHz spectrum to be retained. Network sharing arrangements may not be able to deliver the same level of cost savings as access to 900 MHz spectrum ✂.

Question 8.2 Do you agree with Ofcom's assessment of the merits of Option A (Liberalisation in the hands of the incumbents) for the implementation of the RSC Decision in respect of the 1800 MHz spectrum?

T-Mobile agrees with Ofcom that the market can be expected to function well to ensure 1800 MHz spectrum is used in an efficient and pro-competitive manner without the need for mandatory reassignment of the spectrum. In particular, liberalisation of the 1800 MHz spectrum would not be expected to lead to any supra-normal profits given competition between the four 2G/3G operators (all with access to 1800 MHz spectrum) as well as Hutchison (with access to 2.1 GHz spectrum).

Question 9.1 Do you agree with Ofcom's assessment of the merits of Option B (Liberalisation in the hands of the incumbents subject to a roaming condition) for the implementation of the RSC Decision in respect of the 900 MHz spectrum?

T-Mobile agrees with Ofcom's assessment of Option B. Regulated roaming would be a poor substitute for reassigning 900 MHz spectrum between operators. Regulated access cannot hope to match the dynamic efficiency benefits created by direct competition such as was experienced with 2G and 3G (at 2.1 GHz) competition in terms of greater network rollout and service innovation. Indeed, regulated access may discourage such investments as the 900 MHz operators would bear the full loss if the investment were unsuccessful (for lack of demand or technology reasons) but would be required to share any gains from the investment if it did succeed. Further, national roaming would risk a loss of competition as shared costs and uniform service quality would support coordination between operators. Moreover, regulatory price-setting carries the risk of regulatory error due to incomplete information and this can deter investment and distort competition.

To the extent that there may be productive efficiency benefits from avoiding additional network rollout in rural areas, such benefits can be achieved by allowing for network sharing between operators. Accordingly, reassigning 900 MHz spectrum (as well as allowing pro-competitive network sharing agreements) would enable large competitive benefits as well as providing for gains in productive efficiency. For these reasons, regulated roaming should be considered a significantly inferior solution to reassigning the 900 MHz spectrum.

Question 9.2 Do you agree with Ofcom's assessment of the merits of Option B (Liberalisation in the hands of the incumbents subject to a roaming condition) for the implementation of the RSC Decision in respect of the 1800 MHz spectrum?

T-Mobile agrees that there is unlikely to be any market failure that would justify intervention to regulate access to roaming services using 1800 MHz spectrum. Commercial roaming will be offered if it is economic to do so and imposing regulation would simply create unnecessary costs and carry the risk of prices being set inefficiently.

Question 10.1 Do you agree that in principle some form of mandatory release of 900 MHz spectrum is appropriate in order to implement the RSC Decision?

T-Mobile agrees that the mandatory reassignment of some 900 MHz spectrum is both appropriate and necessary in order to implement the RSC Decision and is consistent with Ofcom's duties under the Communications Act. As

T-Mobile has outlined earlier in this response, a reassignment of spectrum in which each operator receives access to some 900 MHz spectrum will:

- generate large efficiency benefits in terms of achieving a particular quality of service at much lower overall economic cost than would be achieved in the absence of a reassignment; and
- promote competition by enabling each operator to drive prices lower and to compete effectively on coverage, quality of service and the introduction of innovative new services.

Indeed, T-Mobile considers that Ofcom's medium to high demand scenarios are conservative as a number of factors are acting to significantly accelerate 3G subscriber numbers and use of 3G services including the greater availability of smarter and more user-friendly multimedia handsets, improved service quality particularly with HSDPA and the availability of greater content and new service applications. Moreover, as 3G handsets sale grow worldwide, their price is coming down thereby supporting even faster growth.

We note that while Ofcom's high demand scenario assumes around 35% of mobile subscribers will have 3G handsets in 2010, independent market research firms are predicting higher take-up. For instance, Forrester expects that 68% of all UK mobile subscribers will use 3G and more than 50% will regularly use mobile Internet services by 2010.[7]

Further, while Ofcom have noted the potential for a small offsetting efficiency effect in terms of the duplication of networks, T-Mobile considers that in areas in which additional networks are uneconomic, network sharing arrangements can function so as to avoid any inefficient duplication.

T-Mobile also considers that the cost of releasing some 900 MHz spectrum as proposed by Ofcom would be limited and much smaller than the expected benefit of such a reassignment. T-Mobile agrees with Ofcom that Synthesised Frequency Hopping (SFH) can be used to help provide the required traffic capacity even after the release of the spectrum through enabling tighter frequency re-use within the network. Further, SFH is practical and cost effective to implement.

We note that there are 2 fundamental approaches to frequency hopping. One is called base-band and the other is SFH. In the base-band approach, the number of transmitters at the cell is equal to the number of hopping frequencies. Each of these transmitters operates at a fixed frequency. On a frame-by-frame basis, calls are switched to each particular transmitter. In this approach, each transmitter is combined using a cavity combiner.

SFH is more sophisticated in that the radios synthesize the transmission frequency of each TDMA frame. This approach allows a broader number of frequencies to be employed in the hopping pattern, thus increasing the benefits of frequency diversity and providing greater flexibility in managing the overall frequency plan. In a GSM BTS, this is implemented via a hybrid combiner which normally has a bandwidth of the GSM band, rather than fixed to particular frequency subset.

As a SFH configuration requires a hybrid combiner while a based band hopping configuration will use a filter combiner, it can be demonstrated from vendor base station radio link budgets that the link budget for a hybrid combiner configuration is approximately 1dB less than a filter combiner configuration. In practical terms, this means that there will be no loss of coverage and that SFH is a practical solution.

T-Mobile also agrees with Ofcom that Vodafone's and O2's 2.1 GHz 3G networks can be used to provide the remaining capacity required to compensate for the proposed release of some of their 900 MHz spectrum. Moreover, as noted above, the actual take-up of 3G handsets is likely to be significantly greater than Ofcom's assumption and this will reduce the amount of, and cost of, additional take-up required to accommodate spectrum release.

---

[7] Forrester, *UK Mobile Forecast: 2005 To 2010*, 19 January 2006.

Question 10.2 Do you agree that in principle some form of mandatory release of 1800 MHz spectrum is unlikely to be appropriate and that Option A is likely to be the most appropriate means to implement the RSC Decision in respect of the 1800 MHz spectrum?

T-Mobile agrees that mandatory release of any of the 1800MHz is inappropriate as it would lead to costs without any compensating benefits (i.e. it would be unlikely to promote efficient or competition to any material extent).

Question 11.1 Do you agree with Ofcom's assessment that the version of Option C in which there is the simultaneous release of three 2 x 5 MHz blocks of 900 MHz spectrum in 2010 is likely to be the most appropriate means to implement the RSC Decision in respect of the 900 MHz spectrum?

T-Mobile accepts that Option C provides a reasonable means to implement the RSC Decision, albeit that it would lead to Vodafone and O2 retaining a larger share of the 900 MHz spectrum. T-Mobile agrees that each operator can obtain most of the cost advantages associated with 900 MHz spectrum with just one block of the spectrum (i.e. 2 x 5 MHz). If less than this amount of spectrum (i.e. 3 blocks) were released, at least one operator would be forced to incur higher costs in seeking to match the coverage of the others and this would imply a loss in efficiency and potential harm to competition.

On the other hand, T-Mobile agrees that it would not be appropriate to release a fourth block of spectrum to a new entrant as, even if such entry ultimately occurs and was sustainable, there would be negligible competitive benefits and none to justify the substantially higher costs that would be created in accommodating the release of the spectrum.

T-Mobile would support the 3 blocks of 900 MHz spectrum being released simultaneously in 2010. Simultaneous release will help prevent competition being distorted by differences between operators in the timing of access to 900MHz spectrum for 3G services. In T-Mobile's view the European market evidence shows that first mover advantages may be long-lasting in mobile markets. Releasing the spectrum in 2010 would give each operator the same ability to decide when to utilize their spectrum holding for 3G and would not unduly delay the benefits of liberalisation from being realized given the need to first increase 3G take-up so as to cost effectively accommodate the release of spectrum.

For reasons of competitive neutrality, the 900 MHz spectrum rights retained by Vodafone and O2 should not be liberalized until after the released spectrum has been reassigned to the other operators. To alternatively allow for liberalisation in advance would provide Vodafone and O2 with an artificial competitive advantage that may weaken competition in the overall mobile market.

T-Mobile does not have strong views on allowing operators to reach agreements between themselves as to the early release of spectrum prior to a final deadline. However, we would be concerned if such arrangements competitively disadvantage some operators relative to others.

Question 12.1 Do you agree with Ofcom's proposal for the mechanism of release and the terms and condition for the released 900 MHz spectrum?

T-Mobile would support the use of either an auction or a beauty contest for the re-assignment of the 900 MHz spectrum with the condition that the existing 900 MHz operators would not be allowed to acquire the released spectrum. T-Mobile notes that the existing mobile operators without access to 900 MHz spectrum would be highly likely to acquire the released spectrum given the complementarities with their existing networks. As such, an assignment process should be chosen that minimises the costs (to both Ofcom and the parties) and market uncertainty. The renewal of spectrum licences in Norway may provide an appropriate example where any new

entrants were required to register their interest and submit a bank guarantee to ensure that they were genuine bidders. As no new bidders registered their interest, the licences were renewed (i.e. in the case of reassignment the licences would be provided to the three non-900 MHz operators unless other bidders indicated a genuine interest in the spectrum).

✂.

Question 12.2 Do you agree with Ofcom's proposal for the terms and conditions for the retained 900 MHz spectrum?

T-Mobile supports the proposed terms and conditions for the 900 MHz spectrum (i.e. in line with the terms and conditions applying to the reassigned spectrum) as the best means to ensure competitive neutrality between operators and thereby promote efficient investment.

Question 13.1 Do you agree with Ofcom's assessment of the merits of Option D (Full Mandatory spectrum Release) for the implementation of the RSC Decision in respect of the 900 MHz spectrum?

T-Mobile agrees with Ofcom's assessment that a full mandatory spectrum release is unlikely to be appropriate as it would deliver marginal, if any, additional competition or efficiency benefits compared with Option C while it would carry significantly higher costs for the 900 MHz operators.

Question 14.1 Do you agree with Ofcom's proposals for the implementation of the RSC Decision in relation to the 900 MHz spectrum?

For the reasons discussed above, T-Mobile would support Ofcom's Option C in which 3 blocks of 900MHz spectrum are re-assigned in 2010 by either an auction or beauty contest. Further, the existing 900 MHz operators should be restricted from bidding for the re-awarded spectrum so as to ensure that competition and efficiency are promoted by the reassignment. The existing 900 MHz operators should also be restricted from refarming their spectrum prior to the spectrum reassignment and their spectrum should be subject to the same terms and conditions (including the same price per MHz) as apply to the re-awarded spectrum.

Question 14.2 Do you agree with Ofcom's proposals for the implementation of the RSC Decision in relation to the 1800 MHz spectrum?

T-Mobile supports Ofcom's proposal for the liberalisation of 1800 MHz spectrum with the existing wide distribution being retained given that there would be no competition or efficiency benefit from re-assigning the spectrum, while there would be costs in doing so. T-Mobile also supports liberalisation (for 3G at least) in 2008 or 2009 as well as the introduction of trading in relation to this spectrum and the change to a perpetual licence term subject to five years notice for spectrum replanning purposes.

Question 15.1 Do you think that Ofcom should make the 900 and 1800 MHz spectrum available for systems other than GSM and UMTS? If so, for what systems, on what timescale and by what mechanism?

The RSC Decision allows any systems other than GSM and UMTS to be authorised provided that they can co-exist with GSM and UMTS both in the UK and in neighbouring Member States. T-Mobile agrees that, in general, other mobile FDD technologies that respect the same uplink/downlink arrangements as current GSM use could use the spectrum. We also agree that the work in CEPT in response to the WAPECS mandate, particularly the work on 'Block Edge masks', may have a bearing on Ofcom's approach.

In this regard, the spectrum conditions should allow 3GPP LTE to be deployed in these bands in the future. We expect 3GPP LTE to fully meet the conditions contained in the RSC Decision.

On balance, T-Mobile would support Approach B, i.e. initially licences only allow GSM and UMTS but use by other technologies implemented by licence variation on a case by case basis. In the initial period, Approach B provides the strongest safeguard against inadvertent interference problems that could harm quality of service.

Question 15.2: Do you believe that licences for the 900 and 1800 MHz spectrum should be made tradable? If so, on what timescale and should trading be subject to any competition restrictions?

T-Mobile supports the introduction of spectrum trading so as to ensure that spectrum is assigned to the party who can obtain the highest value from it and thereby promote overall efficiency. However, we note that trading of mobile spectrum is not likely to occur in the short-to-medium term.

T-Mobile accepts that Ofcom may have a genuine concern to ensure that trading in spectrum rights does not lead to one operator gaining a dominant position through building up its spectrum holdings relative to the other operators. T-Mobile would support a case-by-case review of the competitive impact of particular trading proposals with a safe harbour being provided for trades where a player has relatively small market share and where the spectrum being acquired is a small amount of total spectrum suitable for that service.

Question 16.1 Do you believe that the licences for 2.1 GHz should be liberalised and if so on what timescale?
Question 16.2 Do you believe that the licences for 2.1 GHz should be made tradable and if so on what timescale?

T-Mobile supports the liberalisation and introduction of trading for 2.1 GHz spectrum to promote efficient spectrum use. Liberalisation and trading could be introduced as soon as practicable subject to Ofcom sufficiently resourcing higher priority reforms.

T-Mobile
5th December 2007

Confidential Annexes