1 May 2009

Application of Spectrum Liberalisation and Trading to the Mobile Sector: T-Mobile's response

T-Mobile welcomes the opportunity to respond to Ofcom's consultation, Application of Spectrum Liberalisation and Trading to the Mobile Sector.

Executive Summary

Mobile spectrum liberalisation carries the potential for substantial consumer benefits as operators are able to offer significantly better levels of 3G coverage with the potential for higher quality mobile broadband offerings. However there is also a significant risk, in the form of harm to competition in the UK mobile market, if only a small set of operators are able to benefit from this. The competitive nature of the UK market is unique and any diminution of this would overshadow any potential consumer benefits of liberalisation.

Ofcom's current proposals would make it impossible for all the operators in the UK to get access to 900 MHz spectrum. This would lead to a significant reduction in competition. Some operators would then, through no fault of their own, be prevented from offering a comparable 3G service, despite the investment of £4bn in their 3G licence. This could only lead to negative consequences for further investment in the UK market. **Therefore T-Mobile firmly believes that it is essential that three blocks of 900 MHz spectrum are released.** The UK is one of only two countries across Europe that has already allocating the entire 900 MHz spectrum band and still has GSM operators without access to any of it. The current proposals could therefore mean that the UK ends up with one of the least competitive markets in Europe.

T-Mobile believes that Ofcom's new proposals, which represent a significant change of opinion from their original 2007 proposals, appear to be based on a number of incorrect assumptions. These assumptions skew the results significantly and T-Mobile is confident that if they were corrected, the cost benefit analysis would support the release of more blocks of spectrum. In summary the main assumptions that we believe need to be revisited are:

- **Two RAN sharing operators could share a single 5 MHz channel**: There would not be enough bandwidth for two operators to share a single block [✂];
- **800 MHz spectrum acts as a substitute to 900 MHz spectrum:** Whilst the DDR spectrum is likely to be the closest alternative to 900 MHz spectrum, it is unlikely to be a substitute given the lower level of harmonisation at this band and the higher costs of equipment;
- **800 MHz spectrum will be available only 3 years later than 900 MHz spectrum:** This assumption is inconsistent with the information in Ofcom's own consultation on this spectrum, which Ofcom have also identified to be highly optimistic;
- **Reputational Inertia is not included in the cost benefit analysis:** Given what has happened historically in the mobile industry, where operators continue to suffer a poor public perception of their service even after the underlying issue was rectified, we would expect any operator without access to 900 MHz spectrum to continue to be impacted by this well beyond any interim period;
- **A non-900 MHz operator would definitely get access to the 800 MHz spectrum:** Ofcom have correctly acknowledged that the current incumbent 900 MHz operators

would need to be prevented from bidding for any of the released spectrum. However they have not detailed any similar plans to prevent them bidding for any 800 MHz spectrum, which they deem to be substitutable. The possibility exists that an operator may end up with neither 900 MHz spectrum nor 800 MHz spectrum.

- **The inclusion of "Increased cost of future clearance" in cost benefit analysis:** It is irrelevant, despite being intuitively correct, that forcing Vodafone and O2 to release spectrum now will make it more costly for them to clear further spectrum for themselves in the future. However it is this increased cost, whilst not referred to in the main body of the consultation, which is used to justify not releasing more spectrum to other operators now. It is surely more important for every operator to have access to a single block of 900 MHz spectrum before Vodafone and O2 are able to refarm a second block;
- **The treatment of increasing coverage to less densely populated area:** It is unclear how exactly Ofcom is calculating the cost of expanding coverage to less densely populated areas. The cost differential included in the consultation is not consistent with the site differential calculated. In addition these separate costs appear to be excluded from the cost benefit analysis described in Annex 7.
- **The inclusion of a "delay to liberalisation" cost:** Ofcom states in the document that they will legally not be able to prevent incumbent operators from refarming their low frequency spectrum before others have access to it. T-Mobile does not think that Ofcom's analysis is correct. Nevertheless if this is Ofcom's view, then they need to remove the cost of delay from their cost benefit analysis;
- **Including cost savings only made by RAN sharing 2100 MHz operators:** T-Mobile has consistently argued that Ofcom need to either assume that every operator has access to a network sharing deal or that no operator has access to it. The fact that Vodafone and O2 have announced their own arrangement shortly after this consultation was released, demonstrates the serious problem with the viewpoint that Ofcom have taken;
- **Operators will decommission 2.1 GHz in 2013 if they get 900 MHz in 2011:** The value of 900 MHz for 3G would come from combining the capacity available from higher frequencies i.e. 2.1 GHz with the extended coverage capabilities offered by the lower frequency band of 900 MHz. T-Mobile thinks that both bands will therefore be needed;
- **Expected rollout of UMTS 900 on Vodafone and O2's sites:** T-Mobile believes that it is extremely likely that the 900 MHz operators would rollout UMTS 900 to all their sites for both coverage and capacity reasons. It will therefore be impossible, both physically and financially, for non 900 MHz operators to match the indoor coverage that this rollout would provide due to the much larger number of sites needed at higher frequencies; and
- **The impact on total welfare should be used to determine the best option:** T-Mobile thinks that given that Ofcom's goal is to ensure that UK consumers and citizens continue to enjoy the greatest possible benefit; the impact on consumer surplus should be the most relevant information when determining the correct policy to follow.

T-Mobile is confident that when these erroneous assumptions, together with others detailed in this response, are rectified, then the case for releasing more blocks of 900 MHz spectrum will be apparent. Only then will a truly level playing field exist for all the mobile operators.

T-Mobile agrees with Ofcom 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.

Response to Consultation

As T-Mobile have stated consistently during this process, we think that the only fair solution to the spectrum liberalisation situation is one that allows all operators to have access to their own 2 x 5 MHz block of 900 MHz spectrum. This would allow operators to compete effectively with Vodafone and O2 in the future for 3G and other data services. **Therefore T-Mobile firmly believes that it is essential that three blocks of 900 MHz need to be released.** We remain convinced that Vodafone and O2 should be able to release 2 x 7.5 MHz of spectrum, and the economic benefits of all operators having access to this valuable spectrum will outweigh the costs incurred through clearing the spectrum.

Ofcom should be congratulated for creating the vibrant competitive market that currently exists for mobile services. It is essential that this market, which is unique across Europe, continues to develop competitively. T-Mobile is worried that if the current proposals are allowed to stand, some operators will end up being "tier two" operators, without any opportunity to compete effectively in the future against the "tier one" operators, with access to 900 MHz spectrum. This will undoubtedly be a less efficient market structure and would threaten future investment in this industry. We think that it is essential that all consumers are able to have access to the same level of mobile services, and they are not penalised by a combination of the historical allocation of spectrum and liberalisation.

Within Europe, only the UK and Switzerland have allocated the entire 900 MHz spectrum band and still have GSM operators without access to any of the spectrum.[1] Spectrum liberalisation is therefore unlikely to lead to similar competitive issues in other countries across Europe. Ofcom's current proposals could therefore mean that the UK mobile market could move quickly from being the most competitive to one of the least competitive markets within Europe.

The solution to the liberalisation issue needs to ensure that the current level playing field for 3G services continues once it is possible to use 900 MHz spectrum for 3G services. It needs to ensure that players who have invested significantly over the last ten or more years are not significantly advantaged or disadvantaged as a result of the liberalisation and that they are able to continue to deliver competitive services for consumers.

Given that there are no specific questions listed in the consultation and we are instead invited to "comment on any aspect of our proposals, conclusions and supporting analysis", we have identified key assumptions and issues in the consultation, around which we will frame our response. We will then also describe what we think would happen if Ofcom's current proposals are realised and not all operators had access to 900 MHz spectrum.

Given the strand of the Digital Britain project concerning the modernisation of wireless radio spectrum holdings has been taking place concurrently with this Ofcom consultation, it has been extremely difficult for T-Mobile to allocate sufficient time or resources to both projects. Indeed, whilst T-Mobile has been fully engaged with the negotiations taking place with the Digital Britain project team, it is unclear what will happen if these negotiations are unsuccessful. Will the "imposed solution" that has been referred to, be Government-imposed or the conclusion of this Ofcom consultation? Given these uncertainties, and the fact that negotiations are continuing, T-Mobile is aware that there may be significant issues concerning Spectrum Liberalisation that this consultation response does not effectively deal with. Therefore T-Mobile reserves the right to respond to any aspect of Ofcom's consultation at a

[1] See Annex 1 for more information on the operators across Europe without access to 900 MHz spectrum

later date, when the '*dust has settled*' after the negotiations with the Digital Britain project team. In addition it is important to note that this response is without prejudice to any proposals put forward or considered as part of the Digital Britain project.

Assumption 1: Two RAN sharing operators could effectively share a single 2 x 5 MHz channel

There is not enough bandwidth for two operators to use this small channel for mobile broadband. Mobile broadband is a bandwidth hungry application and it would be extremely difficult for two operators to use a single channel without it becoming capacity constrained very quickly. Ofcom itself has acknowledged this, noting that a single carrier would not give enough capacity if there is high demand for mobile broadband services, and they would need to use their 2.1 GHz spectrum to relieve these capacity issues.[2] In reality this would mean that there would still be major competitive issues concerning the provision of high quality data services, as operators with their own, more extensive, block of spectrum will surely be able to offer a more reliable and higher quality data service. The impact of the resultant on-going competitive disadvantage has not been assessed by Ofcom to any extent.

The maximum number of broadband users that can be supported by a cellular site depends on two principal factors: the target peak data rate to be offered to customers and the busy-hour throughput, determined by typical usage (i.e. GBytes downloaded per month per user)

1) **Performance constrained.** This is similar to the way fixed broadband networks are characterised. Users are offered a nominal maximum data rate but subject to a contention ratio. The nominal maximum data rate is assumed to be 2Mbps. For residential users, the contention ratio is typically quoted from 20 to 50. A similar assessment can be undertaken for the mobile case.

2) **Demand / Capacity constrained.** The maximum number of users is determined by the maximum load that can be supported while still offering a "reasonable" quality to a blend of services. The demand is characterised by the volume per user per month. The underlying demand is assumed to grow at 50% per annum in line with Fixed Internet usage growth. This means that the maximum number of users that can be supported falls over time.

[✂] Whilst this capacity may be sufficient for one operator, it will definitely be insufficient to support mobile broadband for two operators in all areas other than low density rural areas.

Furthermore, Ofcom has not correctly assessed the basis on which such spectrum sharing could be achieved. The arrangement for two operators to share a single carrier would require a Multi Operator Core Network (MOCN) solution, with common interface and a common RNC to help traffic steering. [✂] Ofcom mistakenly assume that two RAN sharing operators could share a single block of spectrum.[3]

[✂]

Ofcom appear to have fundamentally misunderstood our network sharing agreement if they think that sharing spectrum (particularly sharing substantially less spectrum) would be the natural progression from the current RAN sharing agreement and that it might be more competitive. [✂]

[2] See A7.27 and associated footnote 7
[3] See footnote 96 to paragraph 5.67.

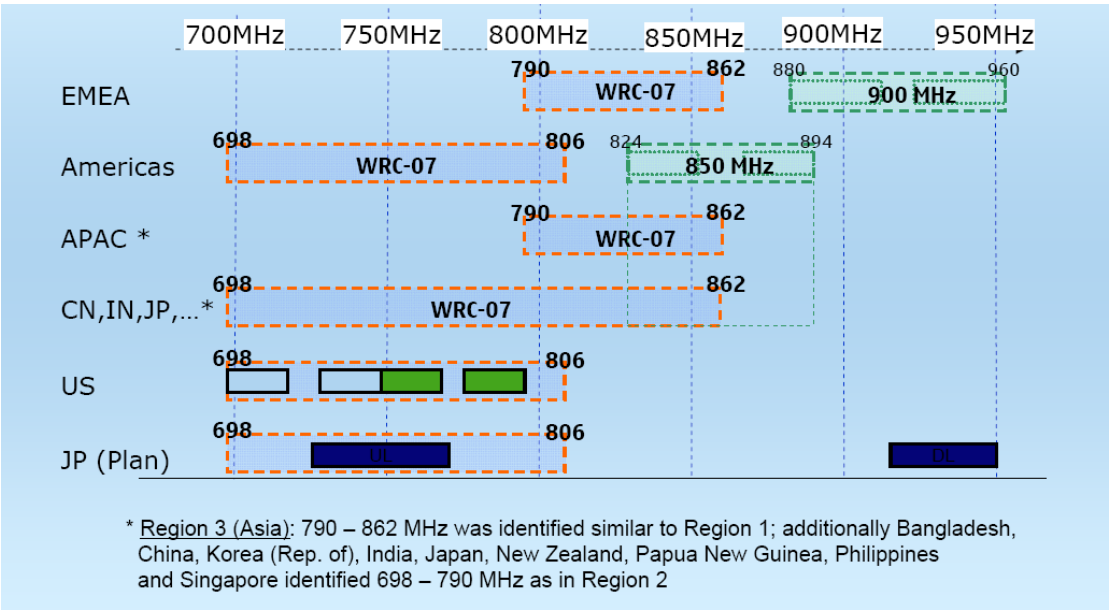
Assumption 2: 800 MHz spectrum acts as a substitute to 900 MHz spectrum

T-Mobile strongly supports Ofcom's proposal to clear the 790 – 862 MHz band which is expected to provide significant economic benefits to the UK. The digital dividend spectrum is likely to be valuable spectrum for mobile services in the long term. As a result T-Mobile has consistently and continuously argued for Ofcom to allow the UK plan for DDR spectrum to be aligned with any CEPT band-plan that is being developed. This would allow mobile operators to benefit from economies of scale as bespoke equipment would not need to be developed for the UK market. If this harmonised approach was not taken, the spectrum being made available would have been of considerably lower value to the UK as a whole. In the event that 900 MHz is not re-allocated to all operators, then this alternative low frequency spectrum would go some way to providing compensation to the non 900 MHz operators. However, there would need to be additional compensation to ensure a level playing field between the operators. This is because whilst the 800MHz spectrum is not an exact substitute for a number of reasons:

a) The scale of European and worldwide harmonisation is unclear

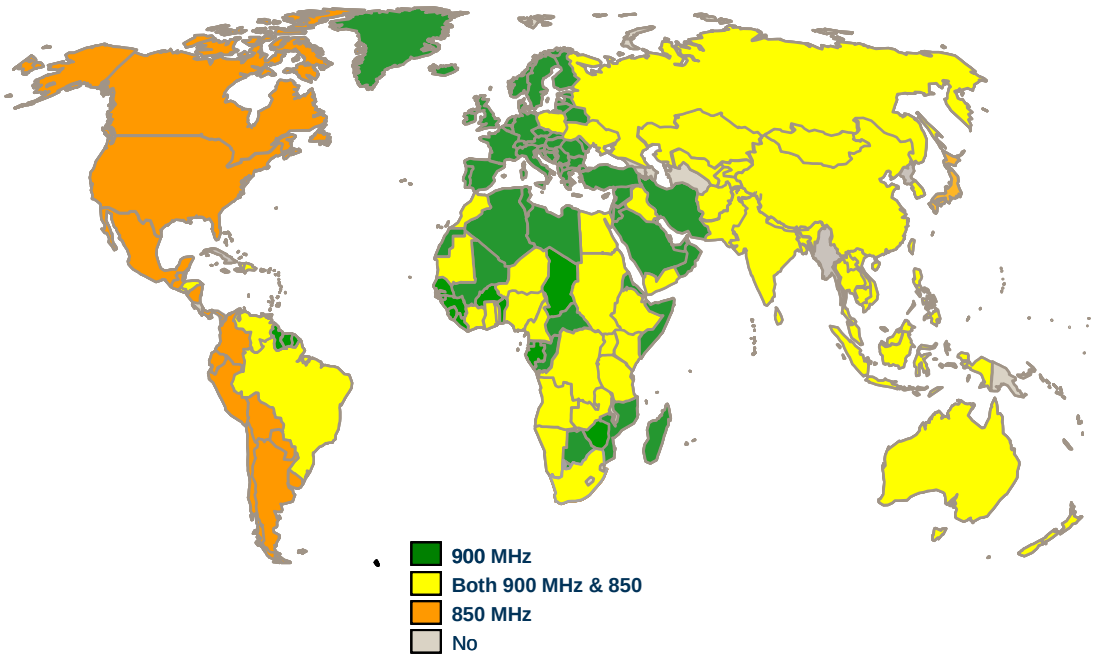
The scale of harmonisation is extremely important to allow the cost effective production of terminals. There is still tremendous uncertainty in mass market equipment availability, particularly terminals, for 800 MHz. Even under the most optimistic scenarios, the 800 MHz spectrum is not expected to achieve the levels of worldwide harmonisation that has already been achieved for 900 MHz spectrum. It is understood that several countries in Europe including Russia, Portugal, Spain and Italy currently have significant problems with broadcasters and/or military use of this band, although these may eventually be resolved. There are therefore great uncertainties in the scale of European harmonisation. Also unlike the 900 MHz band, which is available across most of the world, it is unlikely that major countries outside Europe will adopt the European band-plan. This is because the 800 MHz spectrum is not harmonised in any other region e.g. US, Japan, China, and Africa. In fact many countries have already released different nearby frequencies (e.g. 700 MHz or 850 MHz) for mobile broadband use. Interference issues will prevent them also releasing spectrum in this band as well. Figure 3 below shows the allocations globally around 800 MHz following the decisions at WRC-07. As can be seen, it would not be possible to have a common arrangement globally at 790 – 862 MHz.

Figure 3: Spectrum band-plans near to 800 MHz



By contrast the 900 MHz spectrum is considerably more harmonised globally. This can be seen in Figure 4 below:

Figure 4: Worldwide take-up of 900MHz and 850MHz spectrum bands



The lack of comparative scale means that the costs of terminals and equipment at 800 MHz will always be higher than at 900 MHz.

b) Network equipment availability and costs at 800 MHz are very unclear

Interference issues for the 800 MHz spectrum are uncertain with the band being adjacent to Broadcasting at 790MHz. Ofcom have yet to determine the constraints on the use of 790 – 862 MHz which could limit the usefulness of this band.

The 800 MHz presents challenges for the production of terminals. The FDD (paired) band plan has been finalised in CEPT. The duplex spacing is 41 MHz which is narrower than the 900 MHz band (45 MHz) which will result in the potential for terminal self-desensitisation. Ofcom's recent input to ECC PT1[4] highlights this problem and states:

> "We understand that the duplex spacing of 45 MHz already presents challenges in achieving appropriate levels of ACLR and ACS for mitigating TS (10 MHz) self-desensitisation in the 900 MHz band.[5] We also recognise that a duplex spacing of 40 MHz in the 800 MHz band would only imply increased challenges in this area."

c) 800 MHz spectrum cannot be used effectively in place of a 3G substitute like 900 MHz until a population of handsets becomes available

Whilst it is anticipated that consumer dongles will be available reasonably quickly for the 800 MHz spectrum band, there is tremendous uncertainty in mass market equipment availability, particularly terminals[6]. There are two reasons for this:

- There are insufficient countries harmonising spectrum to be valuable to mainstream terminal vendors; and
- There is a limit on the number of frequencies that can be used by a handset. The limit is currently four, which will be used for the four harmonised bands (900 MHz, 1800 MHz, 2.1GHz and 2.6 GHz) although it is anticipated that this will be increased in due course.

Consumer handsets at 800 MHz will therefore follow significantly behind 900/1800 MHz. Handsets with UMTS 900 MHz capability are already available and being used by consumers in the UK. We understand that 27 handsets and 19 USB dongles already have UMTS 900 MHz capabilities[7]. These are some of today's popular handsets and are not more expensive than other 3G handsets on the market. Given the natural seamless progression to handsets with this capability installed, it will be significantly easier for a 900 MHz operator to migrate customers over to their UMTS 900 MHz Network. The migration of customers to new handsets is one of the most costly and time consuming aspects of investing in a new network [✂]. Nevertheless, given that devices that support UMTS at 900 MHz are already on the market without the need for any migration plans, it follows that the existing 900 MHz networks will derive significant benefits immediately following refarming of their 2G networks.

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[4] ECC PT1(09)048

[5] In 3GPP TS 36.101 a relaxation of the specified UE receiver sensitivity requirement is allowed in Band VIII for a 10 MHz channel bandwidth

[6] See analysis undertaken by GSMA which that there are significant economies of scale to be achieved in the production of terminals with internationally identified common frequency bands. Without the identification of common bands, handset costs would be prohibitively high, and the effect will be a significant reduction in the take-up of any mobile service.
http://www.gsmworld.com/documents/gsma_white_tech_note.pdf

[7] Global suppliers association, www.gsacom.com

Just as it does today, the mobile data market in the future will be made up of devices that can connect fully to the internet through a computer, as well as people connecting to the internet through more traditional mobile handsets, which will have less connectivity. It is relevant that at the recent Digital Britain Summit, Ronan Dunne, the CEO of O2, noted that the iPhone handset is generating more data traffic on their network than mobile broadband dongles.[8] Given that some data-rich services can only be accessed exclusively through full-connectivity devices (e.g. file sharing, HD video streaming), a higher proportion of data may end up being carried on devices that connect through a computer. However it is likely that the revenues generated from data services will be equally significant for both aspects of the data market.

As a result of the importance of revenue generated from mobile handsets, it is significant that we expect mobile handsets to be developed significantly later for LTE 800 MHz than for UMTS 900 MHz. This may mean that operators with only 800 MHz will only be able to compete for a proportion of the high quality data market for a number of years after getting access to the spectrum.

As a result of these differences and the implicit risk with this spectrum, whilst 800 MHz spectrum is expected to become the closest alternative to 900 MHz spectrum, it will never be an exact substitute, and will therefore always be less valuable to operators. As a result Ofcom needs to revise its analysis to take into account the long term competitive disadvantage that non-900 MHz operators will have to deal with.

Based on our discussions with vendors, we think it is extremely unlikely that any UMTS equipment will be developed for the 800MHz band. Therefore any handsets at 800MHz will only be developed for LTE, and only once equipment has been first made for the 2.6GHz band and the 700MHz band in the USA, which have greater economies of scale associated with them.

Assumption 3: 800 MHz spectrum will be available 3 years later than 900 MHz spectrum

Ofcom's assumption of a short length of the interim period between refarming 900 MHz spectrum and the availability of 800 MHz spectrum is inconsistent with what they have said in their separate DDR consultation[9]. The base case in this Spectrum Liberalisation consultation is that the DDR spectrum would be released by 2012. Indeed Ofcom note in Annex 12 that:

> **"Spectrum ready to be used.** The range shown here is for UK-wide use of the spectrum. The earliest date reflects the timing for the Digital Switchover process which is expected to conclude for the UK in late 2012. The actual date of availability will depend on whether Ofcom proceeds with its proposals to re-organise the frequencies covered by the digital dividend so that the whole of 790-862 MHz is made available. If those proposals are adopted then the whole of the band will not be made available until a later date. The end of 2013 has been used below as a reasonable estimate of when that might be."[10]

However Ofcom's own DDR consultation suggests that the full band will instead only be available at the beginning of 2014. Further, at a recent stakeholder event concerning this

[8] http://digitalbritainforum.org.uk/wp-content/uploads/2009/04/digital-britain-summit-full-transcript3.pdf p26
[9] http://www.ofcom.org.uk/consult/condocs/800mhz/
[10] A12.35

spectrum band (on 25/02/09), Ofcom admitted that even this later timetable is highly optimistic. Given that the broadcasters will not start planning for a new plan until they are sure they will be funded (and the source of this funding is currently unclear), it is more likely that the actual date when this spectrum is finally released will be a lot later. A more realistic date for the spectrum being available nationally is mid-2015, which would imply an interim period in total of at least 4 years (potentially stretching to 6 years if other inputs also end up having a later trajectory). The fact that 900 MHz UMTS handsets are already in use in the UK, whilst a harmonised band-plan has not even been agreed for 800 MHz, illustrates the full extent of this *interim* period.

Mobile handsets [✂] are not expected to be available at this band in significant scale for a number of years after the spectrum is available. As a result, the length of the interim period in this consultation will need to be weighted accordingly to take into account of the fact that for a significant segment of the mobile market, non 900 MHz operators will not be able to compete effectively for a longer period.

T-Mobile believes that Ofcom needs to extend their analysis to ensure that two interim periods are included to accurately measure the time before 800 MHz spectrum is able to deliver a close alternative service to 900 MHz spectrum for mobile broadband dongles and separately for mobile handsets.

Assumption 4: Reputational Inertia is not included in the cost benefit analysis

In Annex 9 of the consultation, Ofcom have discussed the potential impact of reputational inertia. Ofcom have stated that this reputational inertia would occur if non-900 MHz operators obtained a reputation for lower quality from its provision of services during the interim period. In this annex, Ofcom describe the sensitivity analysis they have done to incorporate this:

> "Three years of full competition effects 2012-2014 with a diminution in competition effects to zero over a 2 year period 2015-2016." [11]

However Ofcom have not included any of the impact of this sensitivity in any of their analysis of the costs and benefits in Annex 7.

Reputational inertia is something that is very real in the mobile industry and can have a long term effect. We think therefore that Ofcom should have included the impact of this in the base case of their cost-benefit analysis. We disagree with Ofcom that if reputational inertia exists, it would only last for two years after the services on offer are of the same quality. In fact we think that the damage to the operator's brands would continue for a much longer period.

Non-900 MHz operators would develop a public perception of not being able to deliver the same quality of high speed mobile broadband offerings. Consumers are likely to remember this beyond the interim period as brand perception commonly persists for an extensive time following a change in the underlying quality of service. It follows that any competition issues would stretch well beyond the interim period as the brand and reputation would not be immediately addressed by the acquisition of spectrum (which most consumers would be unaware of), but instead will have to be built up from a position of considerable competitive disadvantage.

[11] A9.54

Whilst there is extensive competition in the UK mobile market, it is also a market where consumers rightly will punish operators which have had a reputation for poor quality in the past. Indeed customers, who value a high quality of service, will always be less likely to move to an operator that has had issues with offering this high quality of service in the past, irrespective of any subsequent changes to the levels of service. There have been a number of empirical examples which show how this reputational issue occurs today in the UK mobile market

(a) H3G continues to have a poor reputation for customer service and network reception

In the first few years of H3G's operations, they had a number of significant service related problems. These problems were related to customer service and coverage, particularly to issues concerning call-handover to their roaming partner, O2. Many of these issues were teething problems and were subsequently resolved. However it is notable that the damage to H3G's brand is still very much apparent. In his evidence to the Competition Appeal Tribunal in 2007, Phil Barden, at the time T-Mobile's Director of consumer business, noted this reputational issue:

> *"Probably the most significant problem faced by H3G is that, from the time when H3G first began offering its service, its customers have reported high levels of dissatisfaction because of poor network reception and poor customer service. While, in the first 12 months or so of H3G's having commenced operations, it might have been possible to account for these high levels of dissatisfaction as 'teething troubles' associated with the launch of a new network, it has taken a long time for H3G to overcome its reputation as the network with the least satisfied customers."*[12]

It is very clear to those in the mobile industry that H3G still suffers from these reputational issues now six years after launch. As a result many customers will actively decide not to choose H3G as their mobile provider. It is notable that customers who port their numbers away from T-Mobile, who we would expect to be extremely price sensitive customers and would therefore be attracted by the cheaper contract offerings of H3G, are in fact more likely to choose to move to any other operator rather than port their number to H3G.[13] It appears that a negative stigma, whether acquired though your fault or not, is very hard to shift.

(b) A larger proportion of business customers have remained with Vodafone and O2

Vodafone and O2 had a considerable "first mover" advantage when launching their mobile services a lot earlier than the competing operators. This advantage was dissipated by the large growth in mobile penetration since Orange and T-Mobile entered the market and the advent of the prepay market in subsequent years. However there are still some customers who remain with their original mobile providers from over 20 years ago.

In the business market, particularly the market for large business customers, the incumbent operators still have considerably more business customers than the other operators. These operators were able to prove that they could offer high quality services and as a result the businesses have remained on these operators, despite the fact that other operators have subsequently launched their own business services.

[12] Phil Barden Witness statement, in the CAT 14/12/07

[13] Of the customers that ported their number away from T-Mobile to another MNO in the second half of 2008, H3G was the least popular destination.

These business customers are likely to also be the early adopters of high speed mobile broadband services. Therefore if some operators are allowed to get a head start in offering high quality broadband services, they will likely get a much higher market share in that market for a long period going forwards.

[✂]

Assumption 5: A non-900 MHz operator would actually get access to the 800 MHz spectrum

If the DDR does act as a viable substitute to 900 MHz spectrum (an assertion with which T-Mobile disagrees for the arguments raised above), then Ofcom's current plans for the award do not help to ensure that non-900 MHz operators can compete effectively with the 900 MHz operators. This is because Ofcom have not set out any plans to exclude the incumbent 900 MHz operators from the auction of that spectrum. Ofcom have proposed that Vodafone and O2 should be excluded from bidding from the re-allocated block of 900 MHz spectrum. In the same way, they need to be excluded from bidding for the "substitutable" 800 MHz spectrum so that this spectrum can go to the remaining operators. In fact T-Mobile would argue that in order to ensure a competitive market exists in the future, any low frequency spectrum whose award is linked to the redistribution of spectrum among the existing players in any way should be allocated to those existing players without access to the spectrum (i.e. T-Mobile, Orange and H3G). No other players should be allowed to bid for this spectrum.

Ofcom's analysis relies on mobile operators successfully acquiring 800 MHz spectrum at auction and then having sufficient funds to roll out a network over which to compete with networks already operating 3G services over 900 MHz spectrum. However, given that the 800 MHz spectrum has yet to be allocated and Ofcom has proposed to do this through a competitive auction, there is no guarantee that these assumptions will be realised.

In the original consultation for the award of the DDR cleared spectrum, Ofcom asked a question as to whether they should include a soft spectrum cap on either (a) the cleared spectrum suitable for mobile broadband applications alone, or (b) the holding of any sub-1GHz spectrum suitable for mobile broadband applications, which would trigger action if a significant competition concern emerges in relation to the market structure in the future mobile broadband market.

Whether Ofcom plans to include such a soft cap with the new 800 MHz spectrum has not yet been announced. However even if this soft cap is put in place, it may be set at a higher level to allow the incumbent 900 MHz operators to acquire some 800 MHz spectrum as well. In addition, even if the soft cap would be breached, it is unclear whether this would adequately protect against potential competition issues. There may therefore be the counter-productive opportunity for an incumbent 900 MHz operator to purchase 800 MHz spectrum specifically to leave it unused and therefore not in the hands of their competitors. It is unclear whether competition law would provide a remedy in this circumstance. As far as T-Mobile is concerned, under the scenario whereby some operators have access to more 900 MHz spectrum than others, a low frequency cap needs to be in place to prevent these incumbents from even entering the bidding process for any 800 MHz spectrum without first releasing an equivalent amount of 900 MHz spectrum in return.

Given the difficulties involved with any soft spectrum cap, it would be prudent for Ofcom to treat the 800 MHz spectrum in the same way as any re-allocated 900 MHz spectrum and specifically stop incumbent 900 MHz operators from participating in any auction.

Assumption 6: The inclusion of "Increased cost of future clearance" in cost benefit analysis

Ofcom have included this cost saying that "it is possible that forced spectrum release will increase the costs of future spectrum clearance, if for example, the 900 MHz operators need to clear additional spectrum in the future (e.g. if it were efficient to clear additional 900 MHz spectrum for the deployment of extra carriers of UMTS 900 or to deploy an alternative technology such as LTE)."[14]

It is intuitively obvious that forcing Vodafone and O2 to release spectrum now will make it harder for them to clear further spectrum in the future. What is not clear is the relevance of this hypothetical future cost to the cost benefit analysis that Ofcom are attempting here. What Ofcom have in fact said is that some operators cannot have access to 2 x 5 MHz of their own 900 MHz spectrum, because it may end up impeding other operators plans to potentially refarm 2 x 10 MHz of this spectrum cheaply in five or six years in the future. Ofcom have not justified the inclusion of this cost category and have not considered any of the competitive impacts of Vodafone and O2 being able to refarm even more spectrum for 3G or LTE.

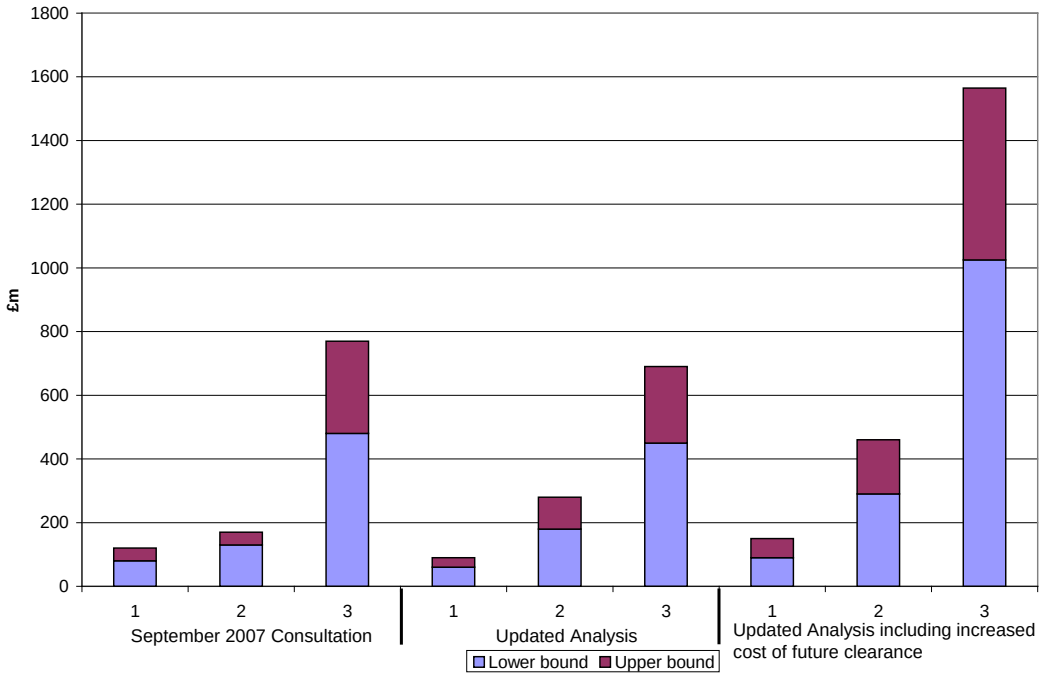
T-Mobile believes that it is surely much more important for every operator to have access to a single block of 900 MHz spectrum before Vodafone and O2 are able to refarm a second block. Indeed if they do not feel that they will be able to cumulatively clear their remaining blocks of 900 MHz spectrum in 2015, these operators could instead use alternative spectrum holdings (at either 800 MHz, 1800 MHz, 2.1 GHz or 2.6 GHz) to deploy the extra carriers that are needed of UMTS or LTE. There is a limited amount of 900 MHz spectrum and it is completely illogical for some operators to be excluded from this valuable spectrum so that others don't incur this purely hypothetical cost in the future if they decide to clear more.

The inclusion of this cost category seems unreasonable and has not been justified at all by Ofcom. It is noticeable that this cost is not mentioned at all in the main body of the consultation document and is only mentioned with scant detail in the annexes.[15] Indeed the inclusion of this new cost category is not even mentioned in the "how we refined our analysis" section of the consultation document. This treatment contrasts significantly with the description and calculation of the actual cost of releasing spectrum which Ofcom have provided in great detail and explained was of a similar magnitude to the costs from the September 2007 consultation.[16]

What Ofcom therefore fail to mention in the consultation document is that the inclusion of this new "increased cost of future clearance" category means that the costs of releasing blocks are artificially made much higher in this consultation. Figure 6 replicates Ofcom's chart with the crucial change of showing how Ofcom's inclusion of this new cost category significantly increases the cost of releasing spectrum. Indeed the cumulative costs of release are now over double the costs from the original consultation.

[14] A7.156
[15] This major cost category is described in only 3 paragraphs in Annex 7, with reference to costs which have been calculated for a different purpose.
[16] See Figure 8 on page 43

Figure 6: Replication of Ofcom's Figure 8 to also include the new "increased cost of future clearance" category



Given the lack of justification that has been given by Ofcom for the inclusion of this cost category and the major problems that T-Mobile has identified with its inclusion, we believe that Ofcom needs to rebuild its cost benefit analysis with this cost category excluded. Its inclusion is undoubtedly indefensible.

Assumption 7: The costs incurred in increasing coverage to less densely populated area

In Annex 14, Ofcom have provided a lot of detail to explain the change in assumptions behind the calculation of the number of sites (at either 900 MHz, 1800 MHz or 2100 MHz) to increase the 3G coverage levels to replicate 2G coverage levels. The conclusion from Ofcom's analysis is that the differential between the base stations required at different frequencies would be approximately 1,600 sites, as opposed to the 2,700 sites determined in the September 2007 consultation.[17] There is a lot of detailed analysis here to determine the new site counts which T-Mobile is still reviewing and may comment on in due course.

In Annex 15, Ofcom take this base station differential and use it to calculate that the cost difference would be between £20m and £60m depending on the speed of roll out.[18] No explanation is given as to why this cost differential is so much lower than the £250m that was calculated in Ofcom's September 2007 Consultation. We would expect a lower cost difference in this consultation, given that the site differential had reduced by 40% (from 2,700 to 1,600). However this new consultation implies a reduction in the cost differential of between 92 and 76% depending on the roll out profile, which is surprising. However there is no way to verify this as no explanation is given for this reduction.

[17] Table 13
[18] See Annex 15, p15

What is also unclear is how the cost differential for the less densely populated area is included within Ofcom's "cost benefit analysis" in Annex 7. In the later annexes, the cost differential between the number of sites needed at 900 MHz and 2100 MHz is dealt with separately for more densely populated areas and less densely populated areas. However in the actual "cost benefit analysis", no different treatment is detailed. Ofcom do state that this "cost benefit analysis" uses different assumptions than in the theoretical later annexes (Annexes 13 – 15):

> Annex 15 sets out results for the cost difference in different market scenarios i.e. the difference between a single or RAN-sharing 2100MHz operator's rollout cost, and the cost of a single 900MHz operator's rollout given the market scenario. These cost differences are a theoretical measure of inefficiency. However, in the CBA we have needed to take account of practical effects which could plausibly occur under different significance scenarios. In addition, while these significance scenarios are consistent with the market scenarios, there are some differences. We do not always want to capture the cost difference using the same assumptions as used in annex 15. Hence, while they are based on the same methodology and models the cost difference results used in the CBA annex will differ from those reported in annex 15.[19]

What is unclear is how the cost differential for less densely populated areas is incorporated into this "cost benefit analysis". Indeed the explanations of the different significance scenarios provided at the start of the annex[20]and subsequent description implies that Ofcom are only looking at the costs for the densely populated areas. It would surely be appropriate for Ofcom to split out the two separate cost differentials in the "cost benefit analysis", as they have rightly done in the later annexes. T-Mobile thinks that there would then be additional cost differences to incorporate, which would impact on the analysis.

Assumption 8: The inclusion of a "delay to liberalisation" cost

There seems to be an inconsistency in Ofcom's consultation surrounding the possibility of delaying the incumbents liberalising their spectrum prior to other operators getting access to the spectrum. In the cost benefit analysis, detailed in Annex 7, there is still a cost included for "delay to liberalisation"[21] in all the scenarios due to Ofcom delaying the incumbents liberalising their spectrum. On the other hand, in other areas of the document, Ofcom imply that, as a result of the amendments to the GSM directive, they would have no way of preventing incumbent operators liberalising their spectrum. If Ofcom now does not think it can legally delay liberalisation, then why is this cost included in the cost benefit analysis? Surely this is an error and the result of disjointed thinking in the production of this consultation document. This would need to be corrected by Ofcom in a more robust cost benefit analysis.

T-Mobile, however does not agree that the amendments to the GSM Directive (in the current draft) oblige Ofcom to make available the whole of the 900 MHz for UMTS before the distortions in competition have been resolved. Ofcom state:

> "Furthermore, it now seems likely that we will be required by European law to "make available" the whole of the 900 MHz band for UMTS as well as GSM systems by no later than six months after the coming into force of the amended GSM Directive. It is our current understanding that to meet this requirement, we will have to liberalise all of the existing 900 MHz licences by the deadline, allowing the deployment of UMTS

[19] A7.89
[20] Figure 1 in Annex 7
[21] For example see Table 35

> as well as GSM technology, irrespective of the situation at the time, or other steps that we might take in regard to this spectrum, for example to promote competition or to secure efficient use of the spectrum."[22]

The text of the GSM Directive has not been finalised yet. However all the versions to date provide a clear obligation on Member States to resolve possible distortions of competition in respect of 900 MHz spectrum. The latest draft text states:

> (recital 5) : "The liberalisation of the use of the 900 MHz spectrum band could possibly result in competitive distortions. In particular, where certain mobile operators have not been assigned spectrum in the 900 MHz band, they could be put at a disadvantage in terms of cost and efficiency in comparison with operators that will be able to provide 3G services in that band. Under the regulatory framework on electronic communications, and in particular Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (Authorisation Directive), Member States can amend and/or review rights of use of spectrum and thus have the tools to deal, where required, with such possible distortions.
> Within six months after its entry into force, Member States should transpose this Directive. While this does not in itself require Member States to modify existing rights of use or to initiate an authorisation procedure, Member States must comply with the requirements of the Authorisation Directive once the spectrum band has been made available in accordance with this Directive. In doing so, they should in particular examine whether the implementation of this Directive could distort competition in the mobile markets concerned. If they conclude by a public consultation:
>
> (5a) The spectrum made available under this Directive should be allocated in a transparent manner and in such a way as to ensure a level playing field in the respective markets."[23]

This would appear to require the transposition of the amended Directive within the 6 month period but not the immediate modification to existing 900 MHz licences. Rather they should consult on both the liberalisation of the 900 MHz licences and what is to be done to prevent possible competitive distortion. There would not seem to be an obstacle to dealing with the second area first. As T-Mobile has made it clear on numerous occasions any liberalisation of 900 MHz spectrum in the hands of the incumbents without an equitable distribution of that spectrum to other mobile spectrum licensees will result in a competitive distortion.

We note that there has been some confusion on the term "make available". Discussions within the RSC have resulted in the Commission services being requested to undertake a formal legal assessment of this term and prepare a document with a common understanding of the relevant legal framework.

Assumption 9: It is correct to incorporate cost savings being made by RAN sharing 2100MHz operators

T-Mobile is very disappointed with the decision by Ofcom to incorporate within its cost model any cost savings that may be made by H3G and us as a result of our network sharing

[22] 8.46
[23] Interinstitutional Files: 2008/0214(COD)

arrangement. This is because any comparative benefit that we receive would only be temporary given that such deals could be reached by the other remaining operators. Indeed, when discussing this issue with Ofcom in 2008, we implored them to either consider that all operators were undertaking such an arrangement or none were. Instead Ofcom has incorporated in its latest proposals the potential savings by two 2100 MHz operators who undertake a network sharing deal without consideration of any potential savings that 900 MHz operators may make through network sharing arrangements. In addition, as described above, Ofcom seem to have fundamentally misunderstood the nature of RAN-sharing and the potential of sharing a single 2 x 5 MHz block of spectrum under that arrangement.

Now that Vodafone and O2 have announced details of their network sharing deal in the UK[24], it is essential that Ofcom revisit their cost model again and prepare a new consultation with new information for the cost of clearing 900 MHz spectrum. This would be consistent with Ofcom's approach of including the cost savings from announced network sharing deals. We would now expect that Vodafone and O2 will have significantly lower costs of clearing 900 MHz spectrum, given their network sharing deal. Indeed given the planned decommissioning of sites under this agreement, Vodafone and O2 would be able to cheaply and effectively manage any cell splitting that would be needed as a result of clearing 900 MHz spectrum.

Using Ofcom's assumption that the combined costs of network sharing operators are 27.5% lower than two single operators, we can calculate that the costs of releasing spectrum can be reduced to:

- between £44m and £65m for releasing 1 block;
- between £131m and £203m for releasing 2 blocks; and
- between £326m and £500m for releasing 3 blocks.

However we would expect Ofcom to undertake more extensive analysis surrounded the exact nature of the network sharing deal and any potential development of it. Given the impact that Vodafone and O2's network sharing deal will have on many of the inputs to the cost benefit analysis, it is essential that Ofcom revisit these costs in order to determine the correct remedy that would now be necessary.

Assumption 10: Operators will decommission 2.1 GHz in 2013 if they get 900 MHz in 2011

As noted earlier, 5 MHz does not provide nearly enough capacity for the future needs of mobile broadband especially if the carrier is shared. The value of 900 MHz for 3G would come from combining the capacity available from higher frequencies i.e. 2.1 GHz with the extended coverage capabilities offered by the lower frequency band of 900 MHz. Both bands are needed.

Moreover, experience tells us that handset migration from one band to another takes many years as it relies on the existing base of customers swapping their existing handsets with new ones supporting a different frequency band. This process could take between 5 and 10 years before the number of
2.1 GHz-only handsets is at a sufficiently low level to clear the band and allow de-commissioning and refarming. This is more likely to be driven by the migration of 3G traffic to next generation technologies such as LTE rather than the availability of 900 MHz.

[24] In addition to the network sharing deal which Vodafone have already announced with Orange. See, eg, the Guardian of 8 February 2007.
http://www.guardian.co.uk/media/2007/feb/08/digitalmedia.mobilephones

Assumption 11: Expected rollout of UMTS 900 on Vodafone and O2's sites

In the consultation, Ofcom say that it is likely that under their medium scenario for the demand for mobile broadband, the incumbent 900 MHz operators would only roll-out a UMTS 900 network on 4,500 sites which the 2.1GHz only operators could match up to a certain extent dependent on them being part of a network sharing agreement.

In reality, it's extremely likely that the 900 MHz operators will rollout UMTS 900 to all their sites for both coverage and capacity reasons. It will be impossible, both physically and financially, for 1800 MHz and 2100 MHz operators to match the indoor coverage that this rollout would provide due to the much larger number of sites needed at the higher frequencies.

Assumption 12: The impact on total welfare, as opposed to consumer surplus, should be used to determine the best option

Ofcom's consultation states that the method for determining the most beneficial policy to follow is to consider the net benefit in terms of total welfare (i.e. the change in consumer and producer welfare). This is in contrast to Ofcom's normal practice in considering what the best policy is to increase consumer welfare. Indeed the use of total welfare implies that gains to consumers are less important than the losses to firms' owners as the result of increased competition reducing profits. If Ofcom decided instead to look at the impact on consumer surplus, it would appear that, even with the numerous incorrect assumptions detailed above, releasing only 1 block would not be the most beneficial option.

Ofcom argues that while "the absolute size of the consumer surplus increase [in releasing 2 blocks rather than 1 block] is far greater than the costs, this reflects approximately a 30% increase in consumer value for approximately an 190% increase in the costs imposed on stakeholders". This argument is seriously flawed as surely what matters is that under this option, the benefits will exceed the costs as this implies that 2 blocks will raise net consumer welfare.

Ofcom's Impact Assessment states that "our goal is to ensure that UK consumers and citizens continue to enjoy the greatest possible benefit from the use of these and other frequency bands".[25] This seems to imply that the impact on consumer surplus is in fact the most relevant information when determining the correct policy to follow. As long as net change to total welfare is positive, then the option which will lead to the highest level of consumer surplus should be followed.

[25] A5.4

Do Ofcom's current results support releasing only 1 block of 900 MHz spectrum?

Ofcom states that "the evidence in favour of any one policy options is not overwhelming". T-Mobile agrees that even with the use of extremely dubious assumptions, the results do not clearly support forcing the 900 MHz operators to only give up 1 block of spectrum, as opposed to giving up more spectrum. Indeed if these erroneous assumptions were rectified, it is likely that the benefits in forcing the incumbents to only give up one block in total would be significantly lower than with the other more equitable solutions. We would invite Ofcom to make the suggested changes to its cost modelling as detailed above to confirm that the remedy of only giving up one block is not an appropriate solution.

Assessment of options for liberalising 1800 MHz 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). [✂][26]. 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 900MHz spectrum to complement its existing holdings with lower frequency spectrum and the benefits this confers (which benefits are considerably greater than those at 1800MHz). In this regard it is important to note the historic reason for the allocation of apparently more 1800 MHz spectrum to Orange and T-Mobile. This was for the stated reason that it did not have the coverage advantages of 900 MHz spectrum. This continues to be recognised in the calculation of the AIP payable by 2G operators.

In short, re-assignment of 1800 MHz spectrum would carry costs but little benefit, as operators are not planning to refarm their 2G spectrum for 3G services. It is 3G at 900 MHz that delivers significant advantages over the current assignments.

[26] [✂]

Annex 1: What would happen if every operator did not get access to 900 MHz

Currently only two network operators in the UK have access to 900 MHz spectrum. Competition in the mobile market will be distorted if 900 MHz spectrum is not reallocated. The much better propagation properties of 3G at 900 MHz compared with 3G at 2100 MHz (or 1800 MHz) would translate into a substantial competitive advantage if the current 900 MHz assignments are retained. These advantages stem from savings in site costs, much better indoor and outdoor coverage, faster rollout (as more coverage is added with each additional site), better call quality (from fewer call handovers), greater availability and lower costs of equipment and handsets.

Whilst all 3G services have been based on 2.1GHz spectrum these advantages have not been evident in the 3G market. However a consequence of liberalisation without reallocation would be that these advantages would be conferred on the 900 MHz operators, and competition would become progressively more distorted over time. Without reallocation:

- In the short term, holders of 900 MHz spectrum would be able to provide better coverage more quickly, both in terms of geographic and in-building coverage, and at a fraction of the cost required to achieve similar (though necessarily inferior) coverage at higher frequencies.
- In the long term, this would lead to a substantial reduction in competition between operators, as holders of 900 MHz spectrum establish a significant advantage over their competitors. This would also limit incentives for 900 MHz operators to innovate and reduce prices and may also deter the non 900 MHz operators from believing that they will be able to generate a sufficient return to justify their own innovation.

No network sharing agreement between non 900 MHz operators would effectively mitigate this result and network sharing by 900 MHz operators could exacerbate it. Ensuring that the above distortion does not arise, and that all consumers can benefit from competition for 3G services, it is necessary to reallocate more than a single block (2x5 MHz) of 900 MHz spectrum, as Ofcom have proposed in their most recent consultation; instead the principles outlined above require all 5 network operators to have a block of 900 MHz.

This is clear from the precedent set in other European countries, where competition considerations have been taken into account and 900 MHz has been made available to almost all GSM operators across Europe. The only exceptions to this are operators in Croatia, Iceland, Slovenia, Switzerland and the UK. Of these countries, the E-GSM spectrum has only already been allocated in Switzerland and the UK. The other countries may rectify the historical disparity by allocating this spectrum to the non-900MHz operators, as other countries have already done across Europe.

Table 1: GSM operators in Europe who do not have access to 900 MHz spectrum

Country	Operator
Croatia	Tele2
Iceland	IMC
Slovenia	Western Wireless
Switzerland	Tele2 and IN&Phone
UK	Orange and T-Mobile

Source: ERO Information Document on GSM Frequency Utilisation within Europe [27] as well as information from T-Mobile and Cosmote operations in The Netherlands and Greece

Without a reallocation of 900 MHz the impacts are expected to be:

(i) Impact on UK Mobile market

Unequal access to 900 MHz spectrum would have a negative impact on the UK mobile market through:

- A reduction in the level of competition between mobile operators, which would lead to a return to the dominance of the 900 MHz operators. The 900 MHz operators, faced with less competition, would be expected to innovate more slowly and reduce investment in data services.
- Cheaper roll-out of 3G services using refarmed 900 MHz spectrum would allow the 900 MHz operators to provide significantly better coverage. This would reinforce the ability of the 900 MHz operators to deliver the universal service commitment, further exacerbating the inability of non-900 MHz operators to compete.
- The non-900 MHz operators would become relatively unattractive to consumers who want 3G services for a number of reasons. The non-900 MHz operators would have poorer coverage footprints and their costs would be higher as they would have fewer scale economies in relation to their network and non-network costs. This would be expected to lead to them having a reduced ability to compete, both for new services such as premium content rights, as well as basic subscriptions for voice/data.
- Refarming without reallocation between existing operators would therefore damage competition and hence damage consumer welfare.

(ii) Impact on UK consumers

Unequal access to 900 MHz spectrum would have a negative impact on UK consumers through;

- Poorer coverage by the non-900 MHz operators for data services, relative to the 900 MHz operators, would lead to reduced competition and so reduced consumer choice, lower levels of service and innovation, and higher prices.
- With reduced innovation in the UK mobile market, new services will take longer to develop and the non 900 MHz networks would be unlikely to be able to offer a full choice of services.
- Additional mobile masts as non-900 MHz operators seek to match the coverage of 900 MHz operators.

(iii) Impact on UK competitiveness and the UK economy

[27] www.ero.dk/fc2e8966-1db9-445b-a8d5-e5c7cf825cc2?mid=97605DCA-E7D9-4E5A-84B7-1E84586C7205&frames=no

- The 900 MHz operators would face weaker competitive constraints and so would innovate more slowly and reduce investment. The sustainability of investment in the UK mobile market would therefore be at risk.
- Reduced innovation in e.g. data services would have an impact on UK productivity and UK growth. The UK market would therefore be less attractive to new potential entrants (including MVNOs) and shareholder confidence in non-900 MHz operators would also be expected to weaken.

(iv) Impact on operators without access to 900 MHz spectrum

- Without access to 900 MHz spectrum following refarming the non 900 MHz spectrum operators cannot be effective competitors. In particular for data services, they would have a reduced coverage footprint and lower levels of in-building coverage than their 900 MHz competitors.
- Ofcom has estimated it would cost the non 900 MHz operators £2.2bn to provide the same level of coverage as Vodafone and O2 using 2.1GHz spectrum.[28] However this calculation is prefaced by the assumption that the operator would be able to physically build the large number of sites that would be needed.
- The mobile operators in the UK are all major international or European telecommunications players. As such, decisions are made as to where across their respective groups investment funds are directed. A level playing field in the UK broadband market is needed to ensure that investment funds continue to be allocated to the UK.

[28] Ofcom, Application of Spectrum liberalisation and trading to the mobile sector, 13 February 2009, 4.44