Commission for
Communications Regulation

Consultation Paper

Inclusion of the 1800 MHz Band into the Proposed joint award of 800 MHz and 900 MHz Spectrum

Document No:	**10/105**
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All responses to this consultation should be clearly marked:-
"Reference: Submission re ComReg 10/105" as indicated above, and sent by post or e-mail to arrive on or before 5pm on 21 January 2010 to:

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Please note ComReg will publish all respondents submissions with the Response to this Consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24

Contents

1 Introduction

In Section 2.5 of its consultation paper on the proposed joint release of the 800 MHz and 900 MHz spectrum bands ("Consultation 10/71")[1], published in September 2010, the Commission for Communications Regulation ("ComReg") noted that it may be appropriate to also consider the inclusion of the 1800 MHz band.

To facilitate further consideration of this issue, ComReg set out a number of factors which it believed both supported and potentially militated against inclusion of the 1800 MHz band and then invited views from interested parties. ComReg is very grateful for the responses it received to Consultation 10/71 on this particular issue and more generally.

In this consultation paper, ComReg considers the material received from respondents to Consultation 10/71 on the possible inclusion of the 1800 MHz band. In summary, ComReg believes that the reasons put forward to-date and other material currently before it would, on balance, support the inclusion of the 1800 MHz band into the proposed 800 MHz and 900 MHz spectrum release.

This consultation paper discusses various issues related to the inclusion of the 1800 MHz band in the proposed spectrum release. In this regard, ComReg has received independent, economic advice from DotEcon which is published alongside this consultation paper (see ComReg Document 10/105a). ComReg has also received technical advice from Red-M/Vilicom which is also published (see ComReg Document 10/105b).

This document is structured as follows:

- **Chapter 2** considers the European Commission ("EC") decision on 900 MHz and 1800 MHz bands ("the EC Decision"), the current use of the 1800 MHz band in Ireland and ComReg's assessment of whether or not to include the 1800 MHz band in the proposed joint award of the 800 MHz and 900 MHz spectrum bands;

- **Chapter 3** discusses and sets out proposals in relation to the auction format and design including temporal lots, issues surrounding existing GSM 1800 MHz assignments in the band, licence fees and licence conditions;

- **Chapter 4** details and sets out proposals on transitional issues relating to the 1800 MHz band;

- **Annex 1** sets out the current draft Memorandum of Understanding ("MoU") between ComReg and the United Kingdom's Office of Communications ("Ofcom") in relation to the co-ordination and use of radio frequencies in border areas. This is an updated draft MoU facilitating the co-ordination of International Mobile Telecommunications ("IMT") technologies in the 900 MHz and 1800 MHz spectrum bands;

- **Annex 2** provides details of relevant developments relating to the re-farming/liberalisation activities in the 1800 MHz band in other Member States and other countries since the publication of Consultation 09/99;

[1] Non-confidential responses to Consultation 10/71 are available. See ComReg Document 10/103.

- **Annex 3** provides proposed measurement characteristics metrics for the differing spectrum bands; and

- **Annex 4** contains a list of the consultation questions posed in this document.

1.1 Responses to ComReg's previous Consultation Documents on this issue

A number of respondents to Consultation 10/71 noted that Consultation 10/71 was silent on several issues discussed in Consultation 09/99 and accordingly sought ComReg's position on these issues.

To the extent that previous views put forward by stakeholders remain relevant to ComReg's 800 MHz, 900 MHz and 1800 MHz proposals and have yet to be addressed by ComReg, then such matters will be addressed in ComReg's forthcoming response to consultation and draft decision documents.

For the avoidance of doubt, ComReg is grateful for, and has considered submissions and other material put forward by respondents to all of its previous consultation papers, including to Consultation 09/99 and Consultation 10/71. It should be noted that all relevant changes that have occurred since Consultation 09/99 have been considered including the availability of additional spectrum and this will be addressed in ComReg's forthcoming response to consultation and draft decision documents. It should be noted, however, that comments made by respondents to previous consultations may not be overly relevant to the particular issues being set out here for stakeholder consideration. Moreover, as proposals are reconsidered and reconfigured to properly take into account developments (such as the earlier than anticipated availability of 800 MHz spectrum and developments in relation to the 1800 MHz band), it may be the case that issues previously raised by ComReg and views of respondents in relation to same have been superseded by those recent developments and subsequent proposals.

In this consultation document, all views that have a direct bearing on consideration of the inclusion of the 1800 MHz band have been taken into account and have informed the following discussion.

Finally, in the interests of providing visibility as to ComReg's current thinking regarding the overall issue of whether or not to include the 800 MHz band with the 900 MHz band in the joint award ComReg notes that the responses received on this issue have generally been positive. ComReg is currently considering these responses before finalising its decision and for the purposes of this consultation document, ComReg's preliminary view remains the same as that proposed in Consultation 10/71, namely that it is appropriate to have a joint award for the 800 MHz and 900 MHz bands.

2 Timing for availability of the 1800 MHz band

This chapter sets out the current use of the 1800 MHz band in Ireland and discusses the proposals to the EC Decision on the GSM bands, i.e. the 900 MHz and 1800 MHz bands. This is followed by a discussion of the advantages and disadvantages of combining the 1800 MHz band with the proposal for a joint award of the sub-1GHz bands, as outlined in Consultation 10/71. ComReg has considered the responses it received to that consultation in forming its view as set out in this chapter.

2.1 Current use of the 1800 MHz spectrum band in Ireland

The 1800 MHz band is comprised of the 1710–1785 MHz sub-band paired with the 1805–1880 MHz sub-band. As shown in Figure 1 below, the total amount of spectrum in the 1800 MHz band is 2 x 75 MHz. Currently there are three GSM spectrum assignments of 2 x 14.4 MHz each in this band. This means that 2 x 31.8 MHz (including guard-bands) of spectrum is currently unassigned, primarily consisting of a contiguous unassigned block of 2 x 26.4 MHz.

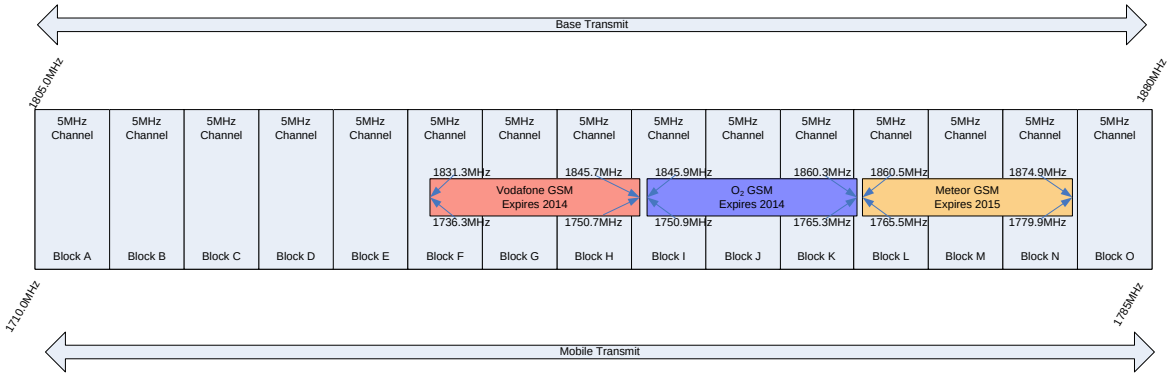

Figure 1: Current Spectrum Assignments in the 1800 MHz band

Three operators, Vodafone, O2 and Meteor, currently hold 15 year licences in this band, as set out in Table 1 below. The band is currently limited to the provision of GSM services. Use of the 1800 MHz band in Ireland is typically limited to urban areas where it is used to provide additional GSM capacity in support of GSM 900 MHz networks.

Table 1: Details of Current GSM licences in 1800 MHz band

Licensee Name	Licence Type	Spectrum Assignment	Licence Expiry Date
Vodafone	GSM Licence	1736.3- 1750.7 / 1831.3 - 1845.7 MHz	31 December 2014
Telefonica O_2	GSM Licence	1750.9 - 1765.3 MHz / 1845.9 - 1860.3 MHz	31 December 2014
Meteor	GSM Licence	1765.5 - 1779.9 MHz / 1860.5 - 1874.9MHz	12 July 2015

2.2 Proposed inclusion of LTE and WiMAX in the EC Decision on 900/1800 MHz bands and implications for the timing of the release of the 1800 MHz band

On 16 October 2009 the EC adopted a Decision (2009/766/EC) on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community which sets out the technical harmonisation measures for the introduction of other terrestrial systems capable of providing electronic communications services that can co-exist with GSM systems in the 900 MHz and 1800 MHz bands ("the EC Decision").[2]

The EC Decision permits the use in these bands of GSM, the Universal Mobile Telecommunications System ("UMTS") and other technologies capable of demonstrating compatibility with these systems, and further acknowledges that other terrestrial systems may be deemed capable of co-existing in these bands in the future.

Various studies are currently underway in this regard and the EC issued a mandate to the European Conference of Postal and Telecommunications Administrations ("CEPT") to develop technical coexistence parameters that could allow Long Term Evolution ("LTE") and other relevant technologies, such as Worldwide Interoperability for Microwave Access ("WiMAX"), to be added to the list of permitted technologies in the Annex of the EC Decision. CEPT has completed this work and it is expected that the report(s) (CEPT Report 40[3], 41[4] and 42[5]) were presented to the EC Radio Spectrum Committee ("RSC") in December 2010. A possible modification to the EC Decision, incorporating these new technologies in 2011, was discussed at the RSC meeting, and while this draft EC Decision is not yet available it is likely that the amendments proposed will be in line with the results of the CEPT technical studies.

As noted in Consultation 09/99, one of ComReg's primary concerns at that time, regarding the timing of the release of the 1800 MHz band, was the lack of certainty regarding availability of equipment in the 1800 MHz band for services other than GSM. As such, ComReg was concerned that releasing the 1800 MHz band in the very short term may be somewhat premature, particularly having regard to its objective of ensuring efficient management and use of the radio frequency spectrum. Based on ComReg's review of recent international developments (as described in **Annex 2**), there now appears to be LTE equipment available in the 1800 MHz band which is being trialled and, in some cases, commercially deployed in several countries.

The implications of these developments, both at an EC level and in other countries, would appear to address, to a large degree, ComReg's previously expressed concerns regarding equipment availability.

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[2] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0032:0035:EN:PDF

[3] CEPT Report 40 - Report from CEPT to European Commission in response to Task 2 of the Mandate to CEPT on the 900/1800 MHz bands "Compatibility study for LTE and WiMAX operating within the bands 880-915 MHz / 925-960 MHz and 1710-1785 MHz / 1805-1880 MHz (900/1800 MHz bands)" – published 18 November 2010 - available at www.ero.dk

[4] CEPT Report 41 - Report from CEPT to European Commission in response to Task 2 of the Mandate to CEPT on the 900/1800 MHz bands "Compatibility between LTE and WiMAX operating within the bands 880-915 MHz / 925-960 MHz and 1710-1785 MHz / 1805-1880 MHz (900/1800 MHz bands) and systems operating in adjacent bands" – published 18 November 2010 - available at www.ero.dk

[5] CEPT Report 42 - Report from CEPT to European Commission in response to Task 3 of the Mandate to CEPT on the 900/1800 MHz bands. "Compatibility between UMTS and existing and planned aeronautical systems above 960 MHz" – published 18 November 2010 - available at www.ero.dk

2.3 Combining the release of 1800 MHz with the 800 MHz and 900 MHz bands – advantages and disadvantages

In Consultation 10/71, ComReg proposed a joint award of the 800 MHz and 900 MHz bands (the sub-1GHz spectrum). While responses received on this issue have generally been positive, ComReg is currently considering these responses before finalising its decision. However, for the purposes of this consultation document, ComReg's preliminary view remains the same as that proposed in Consultation 10/71, namely that it is appropriate to have a joint award for the 800 MHz and 900 MHz bands.

In Consultation 10/71, ComReg also sought stakeholders' views on whether the 1800 MHz band should be included in a joint award for the 800 MHz and 900 MHz spectrum bands. Nine parties responded on this issue. The following section sets out ComReg's assessment of this issue, based on respondents' views and other material available.

2.3.1 Views of respondents

In their responses, both Vodafone and O2 noted a practical concern that the inclusion of the 1800 MHz band could result in the delay of the proposed joint award of sub-1GHz spectrum and for this reason they did not support the inclusion of the 1800 MHz band. Aside from this practical concern, Vodafone and O2's comments supported in principle the case for the inclusion of the 1800 MHz band as both operators acknowledged that these bands are used in tandem to provide mobile services. Meteor/Eircom supported the inclusion of higher frequency spectrum (above 1GHz), including 1800 MHz and 2.6 GHz. H3GI did not, however, support the inclusion of the 1800 MHz band as it considers there is not sufficient demand for the 1800 MHz band. Four other respondents to Consultation 10/71 also generally supported the inclusion of the 1800 MHz band in the proposed joint award, while one other respondent was against its inclusion.

A summary of the statements made by respondents both supporting and not supporting the inclusion of the 1800 MHz band is set out below. It is noted that the reasons put forward by some respondents fall under both categories.

2.3.1.1 Advantages of joint award

A number of respondents supported the inclusion of the 1800 MHz band with several reasons provided.

One of the main points put forward in support is the interdependence between systems in the bands both below and above 1GHz. For instance:

i. A number of respondents pointed to the fact that these bands are used in tandem by mobile operators;
ii. While one respondent submitted that 1800 MHz spectrum is substitutable to some extent for sub-1GHz spectrum for wide area service provision, for the most part, other respondents considered that the usage of spectrum in the sub-1GHz bands and 1800 MHz band is complementary;

iii. The latter respondents noted that operators tend to use the two bands in conjunction with one another for optimal mobile broadband deployment – sub-1GHz for coverage, above 1 GHz for capacity. They added that 1800 MHz spectrum is generally seen as the most suitable band to provide additional capacity for delivery of communications services in areas of particularly high demand. In other words, the complementarity between the bands makes them highly suitable for a joint award; and

iv. As one respondent pointed out *"the evolving spectrum strategies require the use of frequencies above and below basis 1 GHz"* and for this reason it is *"imperative that both types of spectrum are made available and that there is clarity around the timing for the release of such spectrum".*

In light of these linkages between the bands, a number of respondents were in favour of a joint award, based on a number of considerations:

i. Respondents commented that a joint simultaneous award of sub-1GHz spectrum with 1800 MHz spectrum would greatly facilitate operators by providing them with the ability to make choices regarding their desired holdings of spectrum for coverage and for capacity. This should provide flexibility and facilitate network planning across multiple bands in line with technical developments;

ii. The technical linkages between the bands resulted in what one respondent referred to as *"a valuation linkage"* between the bands;

iii. One respondent noted that the inclusion of the 1800 MHz band could increase the economic efficiency of the auction outcome in terms of the allocation of spectrum. This respondent argued that holding back large amounts of potentially substitutable or complementary spectrum and proceeding with a limited auction design solely addressing the 800 MHz and 900 MHz bands could result in a less efficient auction process and outcome. In addition, it was argued that the non-simultaneous release of the 1800 MHz spectrum could result in bidders making errors in the valuation of this band. Along the same lines, a number of respondents expressed a clear preference for big auctions rather than awarding spectrum on a "piecemeal approach". One respondent argues that *"ideally….the maximum number of bands would be made available in a single process"* which was echoed by another respondent who stated that *"It always makes sense combining as many frequencies as possible in a single auction as it allows the operators to be able to plan for the future on a total spectrum basis."* One of these respondents argued that an auction of *"closely related spectrum bands"* reduced the likelihood of inefficiencies and mis-valuation; and

iv. Another respondent noted that the approach being taken by many other national regulatory authorities is to consider the bands in tandem and include the 1800 MHz band when liberalising and planning for the future of sub-1GHz spectrum (see Annex 2 for further discussion).

Another reason put forward in support of the inclusion of the 1800 MHz band was expressed by three respondents who pointed out that, internationally, there appears to be growing interest in the 1800 MHz band for UMTS and LTE technologies (which was referred to earlier in Section 2.2). One of these respondents noted that a number of operators in Europe and elsewhere have already publicly stated that they intend to launch exploratory LTE services within this band, while another respondent noted that LTE equipment for the 1800 MHz band is currently becoming available from vendors. This respondent also noted that

with the move towards LTE, operators will be driven to mainly use frequencies above 1GHz in dense urban areas, with limited use of frequencies below 1GHz in these areas.

In light of these reasons, a number of respondents argued that the 1800 MHz band should be awarded as soon as possible.[6]

2.3.1.2 Disadvantages of joint award

In Consultation 10/71, ComReg also outlined a number of potential disadvantages to the inclusion of the 1800 MHz band. The disadvantages raised by the respondents in submission to Consultation 10/71 for the most part mirrored those set out by ComReg. The drawbacks raised by respondents can be summarised as follows:

i. In Consultation 10/71, ComReg noted that demand for 1800 MHz spectrum may be weak. This concern was echoed by only one respondent which submitted that because *"interested parties have not shown sufficient demand for 1800 MHz"*, the 1800 MHz band should not be included in a joint auction with sub-1GHz spectrum, although this point was not elaborated upon by the respondent;

ii. Two respondents expressed concerns that inclusion of the 1800 MHz band would lead to a process delay. This was considered undesirable given the imminent expiry of certain GSM 900 MHz licences. One of these respondents considered that the benefits of inclusion would be considerably outweighed by the risks and costs of delay that might arise from the need to consult upon and finalise the inclusion of the 1800 MHz band. This respondent was concerned that the need for significant changes could delay the adoption by ComReg of a final decision on the 900 MHz interim licence proposal and other key elements of ComReg's proposals, thereby impacting on its efficient business planning and investment.[7] This respondent further considered that the disadvantages of further delay in the implementation of ComReg's proposals significantly outweigh any potential incremental benefits from including 1800 MHz spectrum in the proposed joint award; and

iii. On the matter of substitutability between sub-1GHz spectrum and 1800 MHz spectrum, two respondents considered that it would be more appropriate to delay the award of the 1800 MHz band and instead conduct a joint award for a number of bands above 1GHz which they regard to be substitutable for 1800 MHz spectrum (e.g. 2.3GHz and 2.6 GHz bands). One of these respondents suggested that *"A simultaneous award of 2.6 GHz spectrum with 1800 MHz spectrum in a future allocation process should …be formally considered"*. This respondent further considered that an allocation process for the 1800 MHz band and 2.6 GHz spectrum should be concluded no later than 2013, with the

[6] One of these respondents in fact argues that the 1800 MHz band should be auctioned before the 800 MHz band to ensure efficient use of existing mobile spectrum. In ComReg's view, doing so would remove the benefits provided by a joint award process.

[7] ComReg notes, amongst other things, concerns expressed by Vodafone and O2 on the potential delay to the overall consultation process and, in particular, ComReg's proposed interim licence proposal (as set out in Consultation 10/71) that might arise from ComReg seeking to include the 1800 MHz band in its 800 MHz and 900 MHz spectrum award proposals. ComReg additionally notes that various issues and concerns were raised by these and other respondents to Consultation 10/71 regarding different aspects of the interim licence proposal. ComReg is currently considering these views and, having the benefit of the material put forward by these respondents, is presently minded to continue developing and refining its interim licence proposal with a view to implementation significantly in advance of GSM 900 MHz licence expiry in May 2011. Please see section 5.1 – next steps.

commencement of new licences for these bands occurring as early as practicable thereafter, while the other respondent also argued that the 1800 MHz spectrum should be awarded well before the expiry of the 1800 MHz licences in late 2014. One other respondent stated that the 2.3 GHz band should be included in the award of sub-1GHz spectrum.

2.3.2 ComReg's view

ComReg has considered the range of views expressed by respondents regarding the 1800 MHz band and whether it should be included in the proposed joint award of sub-1GHz spectrum.

ComReg notes that a number of respondents supported the inclusion of the 1800 MHz band into the joint award with sub-1GHz spectrum, while other respondents supported in principle its inclusion. ComReg agrees that there are interdependencies between the 1800 MHz band and sub-1GHz spectrum , and as discussed by DotEcon[8], and ComReg believes that the 1800 Mhz band can be both a complement and substitute to sub-1Ghz spectrum.

The 1800 MHz band can be considered a complementary spectrum band to sub-1GHz spectrum in the sense that it can be used to provide additional capacity in busier spots while the sub-1GHz spectrum may be more suited to providing wide area coverage. In addition, the 1800 MHz band can also be substitutable to sub-1GHz spectrum in that additional capacity could be provided in either these spectrum bands or an operator could deploy a network using only the 1800 MHz band.

In addition, ComReg agrees that including the 1800 MHz band in a competition increases the economic efficiency of the auction outcome and provides a wider choice of spectrum bands in the competition. Further, ComReg believes that there are other benefits to including the 1800 MHz band in the joint award of sub-1GHz spectrum, including.

- ***Consumer and Competition benefits:*** As set out in 10/71, by its proposal to combine the award of 800 MHz and 900 MHz, ComReg would be facilitating opportunities for new entry into the Irish market. The inclusion of the 1800 MHz band, which is primarily seen as spectrum suitable for providing additional capacity, is likely to enhance the opportunity for entry further. Both new entrants and incumbents would be afforded the possibility of bidding for spectrum suitable for coverage and capacity at the same time, ensuring flexibility for all bidders in terms of spectrum and network configuration choice, business strategies etc.

- ***Providing Regulatory certainty:*** By providing regulatory certainty to the mobile industry regarding spectrum availability, a joint award is likely to, amongst other things, facilitate investment decisions. This benefit was referred to by respondents to Documents 08/57 and 09/99, who supported a combined award process for 800 MHz and 900 MHz spectrum, and potentially other spectrum bands. Respondents asserted that giving clarity on different spectrum bands would allow them to make informed decisions on the future.

[8] See Section 4.2.3 of DotEcon Report ComReg Document 10/71a and Section 5 and 6 of DotEcon Report ComReg Document 10/105a.

Finally, and as discussed in Section 2.1 of this document, the existing licences in the 1800 MHz band have explicit expiry dates and this provides certainty to ComReg on the start date of new licences issued in the 1800 MHz band. Given this certainty and unlike the case of the 2.6 GHz band which is discussed below, it is possible for ComReg to design a competition for the award of the 1800 MHz band.

In relation to the potential disadvantages to the inclusion of the 1800 MHz band, ComReg does not agree with the view raised by one respondent that there is not sufficient demand from interested parties for 1800 MHz spectrum.

i. ComReg has discussed a similar issue previously in relation to the 900 MHz band (see section 6.8.2 of Consultation 09/99) and highlighted that it did not consider it reasonable or indeed necessary for it to conclusively determine the real level of demand prior to deciding to hold, or holding, a competitive award for spectrum.
ii. ComReg notes the views expressed by a number of other respondents regarding the complementarity between 1800 MHz spectrum and sub-1GHz spectrum, as well as the ongoing developments in this band and growing interest in the band across Europe. This indicates that there is demand for this band in other countries.
iii. Recent international developments in the 1800 MHz band (as outlined in **Annex 2)** indicate that there are numerous trials as well as network rollouts occurring in a number of countries.

In relation to the concern expressed by two respondents relating to potential delays caused by the potential inclusion of the 1800 MHz band, ComReg is confident that inclusion would not add 'significant' delay to the process. By consulting on this matter separately with the publication of this document, ComReg intends to advance the process in a speedy manner and not unduly delay the proposed auction or indeed a decision on the interim licence proposal. ComReg's aim is to hold the joint award in mid-2011 and ComReg expects that the inclusion or exclusion of the 1800 MHz band in the joint award would not unduly affect this timeline.

In relation to the view that it could be more appropriate to delay the award of the 1800 MHz band and include it in a joint award for above-1GHz spectrum (e.g. the 2.3 GHz and 2.6 GHz bands), ComReg notes that there are number of drawbacks to this proposal.

Firstly, the exclusion of the 1800 MHz band from the joint award with sub-1GHz spectrum would reduce the efficiency of the award outcome. As highlighted by a number of respondents to consultation 10/71, mobile services are now provided using multiple spectrum bands and an operator can require a mix of spectrum across the different spectrum bands in order to provide a service. The exact mix of spectrum required by an operator will vary depending upon its' needs but it is important to note that spectrum in the 1800 MHz band can be both substitutable and complementary to sub-1GHz spectrum.[9] The inclusion of the 1800 MHz band into a joint award with sub-1GHz spectrum allows bidders to consider a mix of possible spectrum holdings and enables them to obtain different spectrum bands in line with their needs. As noted by a number of respondents to this consultation and DotEcon, this can lead to an increase in the efficiency of the auction.

Secondly, the suggestion that the 1800 MHz band auction should be sequenced to follow that of the sub-1GHz bands, as opposed to a simultaneous award, could result in inefficient outcomes. It is generally accepted that where spectrum is substitutable and/or

[9] See sections 5 and 6 of DotEcon Report (ComReg Document 10/105a) and section 4.2.3 of DotEcon Report (ComReg Document 10/71a).

complementary, it is more efficient to award such spectrum in a simultaneous award process as opposed to running sequential processes. Such an approach allows bidders to consider the mix of possible holdings in different bands and strike trade-offs between these bands on the basis of the price and availability in the award. For example, in response to a sufficiently large price differential, a bidder may be prepared to switch from one spectrum band to another band, and the running of a simultaneous award process can facilitate such switching during the award. In contrast, such switching is not possible during a sequential award process as once spectrum usage rights have been won in an earlier award, it is not then possible to alter this outcome in the course of bidding in the later award. Sequential processes can therefore lead to inefficient outcomes.[10] In line with DotEcon's advice and the views of a number of respondents, it is ComReg's preference to conduct a simultaneous award process.

Finally, the suggestion that the 1800 MHz band could be included in a separate joint award with other above-1GHz bands (e.g. 2.6 GHz and 2.3 GHz) would lead to a delay in the award of the 1800 MHz band on a liberalised basis. While ComReg has commenced work on the release of both bands, the idiosyncrasies associated with each band means that neither is likely to be available in the relevant timeframes. Further, in the case of the 2.3 GHz band, harmonisation issues make it questionable whether this band is either complementary or substitutable to the 1800 MHz band.

2.3.2.1 Consideration of other spectrum bands to include in the joint award

There are three spectrum bands (1800 MHz, 2.3 GHz and 2.6 GHz) that might be considered for inclusion within the award for sub-1GHz.

The 2.6 GHz band

The 2.6 GHz band has been harmonised for the provision of terrestrial electronic communications services and a number of countries in Europe have recently held competitions, and subsequently awarded spectrum, in this band.[11] The services provided in the 2.6 GHz band can be complementary and/or supplementary to those provided by sub-1GHz spectrum and a number of countries, based on their particular national circumstances, have included or are planning to include the 2.6 GHz band in a multiple-band, simultaneous competition.[12]

In Ireland, the majority of this band (144 MHz out of a total of 190 MHz) is currently licensed for a Multipoint Microwave Distribution System ("MMDS"). These licences are subject to the provision of the Wireless Telegraphy (MMDS) Regulations 2003[13] and Regulation 7 and 8 of these Regulations set out, amongst other things, the provisions for the duration and possible renewal (up to 5 years) of licences for a MMDS. While these MMDS licences expire in 2012 and 2014, the legal provision for the possible renewal of MMDS licences prevents ComReg from being able to state with certainty, at this point, when the 2.6 GHz band will become available for competitive assignment.

[10] For example, in the 2001 Swiss Wireless Local Loop award, each licence was sold sequentially and the result of the award process was that similar licences were sold for widely varying prices. This is a strong indicator that the outcome was inefficient, as similar lots should sell for similar prices.

[11] Norway (2007), Sweden (2008), Finland (2009), the Netherlands (2010) and Denmark (2010)

[12] For example, Germany recently held a competition for multiple spectrum bands, namely the 800 MHz, 1800 MHz, 2 GHz and 2.6 GHz bands. www2.bundesnetzagentur.de/frequenzversteigerung2010

[13] Statutory Instrument Number 529 of 2003 (S.I. No 529/2003)

In accordance with the 2003 MMDS Regulations, ComReg is obliged to review the operation of the current licences before making a decision on the potential renewal of MMDS licences. This review process is underway and a wide range of views were submitted to ComReg in response its call for inputs paper[14]. Some of these responses supported competing uses for the 2.6 GHz band and in light of same ComReg has sought external specialist technical and economic advice on possible sharing arrangements for the band. ComReg will bring forward a specific consultation on this matter early in 2011 and in advance of moving to final consultation stage.

Interested parties will appreciate that a decision on the renewal of MMDS licences cannot be made until the matter has been fully explored and considered in line with ComReg's statutory obligations. Given the competing demands for this spectrum band, the complexity of the issue and the current stage of the 2.6 GHz process it is not possible to include the 2.6 GHz band in this particular multi-band auction.

The 2.3 GHz band

ComReg is aware of the important role that the 2.3 GHz band could play in the deployment of high speed broadband services. However, the band has yet to be harmonised for use at an EU or CEPT level and this lack of harmonisation unfortunately creates uncertainty for potentially interested parties. Notwithstanding, ComReg intends to further develop its proposals for the release of this band and will publish a consultation in that regard in 2011 once it has completed technical and economic studies.

2.3.2.2 ComReg's proposal

Having considered respondents' views both for and against the inclusion of the 1800 MHz band in a joint award, and noting in particular:

i. the considerable advantages as discussed above; and
ii. the lack of convincing reasons and/or evidence in relation to not including the 1800 MHz band.

ComReg considers there to be a strong case for the inclusion of the 1800 MHz band. ComReg therefore is minded to proceed on the basis that the 1800 MHz band should be included in its proposed joint 800 MHz and 900 MHz spectrum award.

The following chapter outlines the factors that need to be considered in order to incorporate the 1800 MHz band into the proposals thus far for the award of the 800 and 900 MHz band, as set out in ComReg's previous consultation documents.

[14] In May 2010, ComReg issued a call for inputs paper (ComReg Document 10/38) requesting inputs on this issue, and the non-confidential responses to this call for inputs are available in ComReg Document 10/58.

3 Issues governing the award of the 1800 MHz spectrum

Chapter 2 of this document set out the reasons underlying ComReg's view that the 1800 MHz band should be included in the proposed 800 MHz and 900 MHz award process. This chapter sets out ComReg's proposals in relation to the issues governing the joint award when the 1800 MHz band is included in the auction.

While this chapter focuses mainly on the 1800 MHz band, the proposal is to now include three spectrum bands in this joint award, and so, where relevant, issues relating to the 800 MHz and 900 MHz bands (sub-1GHz spectrum) are also considered.

The issues discussed in this chapter include:

- The auction format for the joint award;
- The spectrum caps to be applied;
- The use of temporal lots for all three bands in the joint award;
- The possibility of an interim licence in the 1800 MHz band;
- The assignment approach for the joint award considering the location of the existing licences in the 1800 MHz and 900 MHz bands;
- The early liberalisation option for the existing GSM licensees;
- The spectrum fees for the 1800 MHz band;
- Substitutability of the 1800 MHz band and sub-1GHz spectrum in the auction and the eligibility points associated with each band; and
- The licence conditions.

ComReg has endeavoured, where possible and appropriate, to make its 1800 MHz proposals consistent with its proposals for the 800 MHz and 900 MHz frequency bands. This approach, in ComReg's view, should bring significant benefits by, amongst other things, reducing the overall complexity of the proposed award process, increasing the possibility of switching between the bands in the course of the auction, and thereby increasing the likelihood of an efficient auction outcome.

ComReg commissioned DotEcon to provide independent expert advice on various aspects of the potential joint award process of the three spectrum bands. DotEcon's report has been published in tandem with this document, see ComReg 10/105a, and amongst other things, DotEcon has considered modifications reasonably required to include the 1800 MHz band.

3.1 The 1800 MHz band plan

In order to discuss the 1800 MHz band, it is important to first describe the proposed frequency arrangements for the band. ComReg is proposing to facilitate the introduction of terrestrial systems other than GSM which are capable of providing electronic communications services in accordance with the requirements of EC Decision 2009/766/EC.[15] Noting the EC Decision and CEPT Reports 40 and 41, in particular, and reasons previously provided by ComReg in the context of the 800 MHz and 900 MHz bands, ComReg is therefore minded to use a Frequency Division Duplex ("FDD") arrangement with a 2 x 5 MHz block size. This is consistent with ComReg's proposed approach for the 800 MHz and 900 MHz bands where an FDD arrangement and a 2 x 5 MHz block size is also

[15] EC Decision 2009/766/EC of 16 October 2009 on the harmonisation of the 900 MHz and 1 800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community

proposed. As shown in Figure 2 below, there are 15 blocks (lots A to O) available in the band plan. The existing 2 x 14.4 MHz assignments of GSM 1800 MHz licensees each span 3 to 4 of these 2 x 5 MHz blocks.

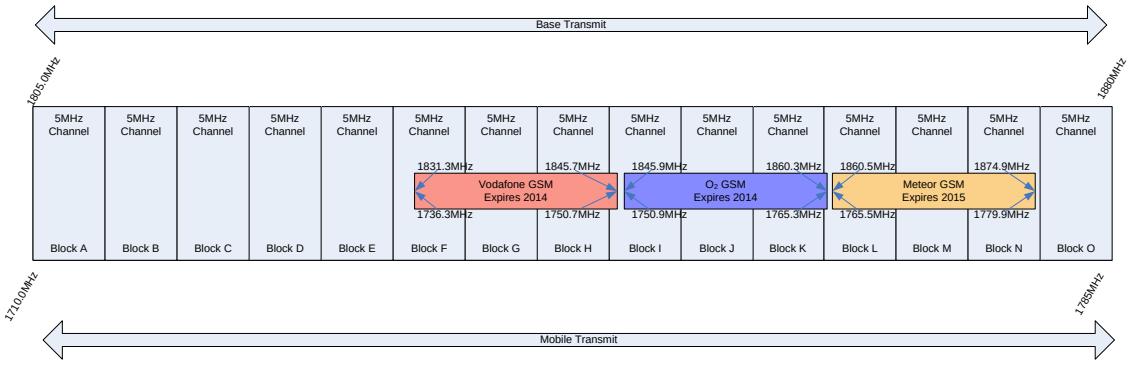

Figure 2: The proposed 1800 MHz band plan showing the existing GSM assignments

Q.1. Do you agree with ComReg's proposal to use a Frequency Division Duplex (FDD) arrangement with a 2 x 5 MHz Block size for the 1800 MHz band? Please provide reasons for your view.

3.2 Proposed Auction Format and Rules

In previous consultation documents (Consultation 09/99 and Consultation 10/71), ComReg set out its proposals in relation to the auction format and rules for the award of spectrum. These proposals have been refined in line with developments and in response to observations raised by submissions to these consultations.

In Consultation 09/99, ComReg proposed a sealed bid combinatorial auction format for the award of the 900 MHz band. In light of the responses received to Consultation 09/99 and the developments which occurred such that the 800 MHz band was also being considered for inclusion in a joint award, ComReg reconsidered the proposed auction format.

As discussed in Consultation 10/71, ComReg came to the preliminary view that in light of these factors, it appeared that an open combinatorial clock auction ("CCA") was a more appropriate auction format given the circumstances. ComReg noted that a CCA had a number of advantages over a sealed bid combinatorial auction format such as mitigating business continuity risks, and reducing incentives for tacit collusion and strategic demand reduction.

The main features of the proposed open CCA which are set out in DotEcon's reports for ComReg (see ComReg Documents 09/99c and 10/71a) can be summarised as follows:

i. The auction will consist of two temporal lots.

ii. The auction will consist of primary bid rounds during which bidders bid on the quantity of spectrum in each band, followed by an assignment round during which bidders bid on the location of spectrum assignments.

iii. After the assignment round has ended and bids in this round have been processed, bidders will be informed of the specific frequencies awarded to them in each time category along with those awarded to all other winners.

iv. To deal with business continuity risks, the auction will also use a relative activity rule whereby bidders can make a 'knock out' bid to ensure they win a particular lot in the

final primary bid round**.** Bidders will know if there are any unallocated lots in the final primary bid round, as they are told the aggregate demand in each category. If a bidder then increases its final primary bid by the value of any unsold lots at final round prices, plus one Euro, it can be sure that it will not be displaced from the winning outcome, regardless of the supplementary bids made by others. This is because the relative cap limits the *incremental* value that can be generated by awarding larger packages to other bidders to the final round prices. This element of the auction has the added benefit that it allows for much more straightforward bidding strategies.

v. The auction will be run with restricted transparency of other bidders bidding behaviour during the auction, revealing information about aggregate demand, but not individual bids, during the primary bid rounds.

vi. The auction will allow for a high level of transparency of the auction itself, and all results and calculations will be verifiable after the auction has been completed.

In light of the proposal to now also include the 1800 MHz band in the proposed auction, ComReg is of the preliminary view that the same auction format, as summarised above and as set out in detail in DotEcon's reports for ComReg (see ComReg Documents 09/99c and 10/71a), should also be used in a joint auction of the 800 MHz, 900 MHz and 1800 MHz bands.

3.2.1 ComReg's proposal

ComReg proposes to use a CCA format (as previously discussed in Consultations 09/99 and 10/71) for the joint award of the three spectrum bands.

3.3 Spectrum Cap

Setting a spectrum cap is an important consideration in the design of any spectrum competition as it can influence the level of demand for spectrum in the competition and ultimately the degree of competition in relevant downstream market/s.

ComReg is of the view that it is appropriate to consider setting a spectrum cap for the 1800 MHz band. If a single bidder (whether an incumbent or an entrant) were to acquire the rights to the entire 1800 MHz band this would potentially adversely affect downstream competition in the longer term. Therefore it is important to place a limit on the amount of 1800 MHz spectrum that any one bidder can obtain in the competition.

ComReg has received advice from DotEcon on the appropriate spectrum cap for this award which is contained in Section 5 of their report (see ComReg Document 10/105a).

There are a number of factors which ComReg has considered in relation to setting a spectrum cap for the 1800 MHz band. These are:

i. Should a spectrum cap for the proposed competition be set separately for sub-1GHz spectrum and the 1800 MHz band, or should there be a multi-band cap;
ii. Should existing spectrum holdings be included in a spectrum cap;
iii. What is the appropriate level for a spectrum cap; and
iv. Should a spectrum cap be applied as a simple fixed cap or would a weighted spectrum cap be more appropriate.

Each of these factors is considered in more detail below. ComReg's overall proposal in relation to the setting of a spectrum cap for the proposed competition is based on its consideration of all of these factors holistically.

In considering an appropriate spectrum cap for the competition, it is first necessary to be clear on the amount of spectrum available in the award process. Under ComReg's proposal, if the 1800 MHz band is added to the joint award, there would be a total of 2 x 140 MHz of spectrum available in the competition across the three bands: 2 x 75 MHz (or 15 blocks) of spectrum in the 1800 MHz band; and the sub-1GHz spectrum which is made up of 2 x 30 MHz (800 MHz band) and 2 x 35 MHz (900 MHz band), or 13 blocks in total.

3.3.1 Setting a Spectrum cap per Band versus a Multi-band spectrum cap

In considering an appropriate spectrum cap for the 1800 MHz band, in the context of a joint award with sub-1GHz spectrum, the first relevant matter is whether the spectrum cap for the competition should be set for each band in isolation (i.e. one spectrum cap for sub-1GHz spectrum and a separate cap for the 1800 MHz band) or be set at a combined, multi-band level (i.e. the 1800 MHz band and sub-1GHz spectrum).

ComReg is of the view that a combined, multi-band spectrum cap appears to be the most appropriate in the context of a joint award for a number of reasons. Each bidder in the auction is likely to have different views on the degree to which they consider 1800 MHz spectrum as complementary or substitutable to sub-1GHz spectrum. A bidder may be prepared to switch from sub-1GHz spectrum to 1800 MHz during the auction, in response to sufficiently greater price differentials between sub-1GHz spectrum and 1800 MHz. Any spectrum cap set for a joint award should not unduly restrict such switching strategies.[16]

ComReg is of the view that a multi-band spectrum cap should be applied in addition to the sub-1GHz cap. This is because the characteristics of sub-1GHz spectrum in terms of its propagation qualities, etc., make it particularly valuable spectrum for mobile use and the provision of wide area coverage. The proposed addition of the 1800 MHz band to a joint auction does not change ComReg's view on the necessity for a sub-1GHz spectrum cap as set out in Consultation 10/71, where ComReg proposed a 2 x 20 MHz spectrum cap for sub-1GHz spectrum. While responses received on this issue have generally been positive, ComReg is currently considering these responses before finalising its decision. However, for the purposes of this consultation document, ComReg's view on the appropriateness of a 2 x 20 MHz spectrum cap for sub-1GHz spectrum still holds.

3.3.2 Consideration of Incumbent's existing spectrum holdings in setting a Spectrum Cap

Another factor to consider is whether existing spectrum holdings by the incumbent mobile operators should count towards the maximum amount of spectrum that an operator can be awarded during the proposed auction.

The overall amount of spectrum held by an operator has an impact on the ability of that operator to compete in the relevant downstream market. Large asymmetries in the amount of spectrum held by different operators can affect the degree of competition in the downstream market, as small spectrum assignments could limit the competitive impact of an operator in the market. Incumbents with large spectrum holdings could therefore be at an advantage

[16] For example, at a certain point in the recent German spectrum auction, referred to in more detail in Annex 2, one bidder, E-Plus, switched its bids entirely from the 800 MHz band to the 1800 MHz band.

compared to new entrants even if both were to be awarded the same amount of spectrum in the competition.

While ComReg proposes to issue licences in this joint award in a technology and service neutral manner, in line with the relevant EC Decisions[17], it is likely that the bands will be used to deploy a mobile service. Currently mobile services are deployed in the 900 MHz and 1800 MHz band using the GSM technology and in the 2.1GHz band using the UMTS technology. Given the expiry date of the existing GSM licences and the proposed 2030 expiry date of the licences issued in this joint award, the only existing spectrum holdings of relevance are the mobile operators' 2.1GHz licences which run until 2022 and 2027. Each of the four incumbent operators has 2 x 15 MHz of paired 2.1GHz spectrum. In total, ComReg is proposing to award 2 x 140 MHz of spectrum in a joint auction. Therefore ComReg is of the preliminary view that the size of these existing spectrum holdings are not likely in themselves to be large enough to materially affect the long-run structure of the market after the award process. It is more likely to be the case that the outcome of the award process itself will be the most significant determinant of the future structure of the mobile market in Ireland. Therefore ComReg is of the preliminary view that the existing spectrum holdings of incumbents at 2.1GHz should not be taken into account in the proposed joint award.

In other circumstances where existing spectrum holdings were much larger in relation to the amount of spectrum being awarded, ComReg may come to a different view on whether they should be considered to count towards a competition spectrum cap.

3.3.3 Setting an Appropriate Level for the spectrum caps

As stated above, ComReg is of the view that it is important to place a limit on the amount of 1800 MHz spectrum that a bidder can obtain in the competition, as an outcome where a single bidder (whether an incumbent or an entrant) acquires the rights to the entire 1800 MHz band would potentially adversely affect downstream competition in the longer term.

If an operator chooses to bid only for 1800 MHz spectrum, and not bid for sub-1GHz spectrum, it is likely to require a significant amount of spectrum in the 1800 MHz band in order to provide an attractive alternative service to those services provided by operators who use sub-1GHz spectrum. ComReg has taken this into consideration in setting a proposed spectrum cap for 1800 MHz spectrum.

A limit of 2 x 50 MHz on the total amount of spectrum any one bidder could be awarded in the joint auction appears to strike a balance between providing sufficient 1800 MHz spectrum to allow an operator to provide a differentiated high bandwidth service, while also ensuring that 2 x 25 MHz of 1800 MHz spectrum is available to other bidders if one bidder was to be awarded the maximum permitted under this cap.

As stated above, ComReg is of the preliminary view that the proposed 2 x 20 MHz spectrum cap on sub-1GHz spectrum should be retained. Combining this sub-1GHz cap with the aforementioned total cap of 2 x 50 MHz, this would mean that an operator who was awarded the maximum amount of sub-1GHz spectrum would be subject to a limit of 2 x 30 MHz at 1800 MHz. This combined multi-band cap appears to be an appropriate limit as:

[17] EC Decision (2009/766/EC) relates to the 900 MHz and 1800 MHz band. EC Decision (10/267/EU) relates to the 800 MHz band.

i. It allows a bidder only bidding on 1800 MHz spectrum to acquire sufficient 1800 MHz spectrum so as to effectively compete with operators that have sub-1GHz spectrum;
ii. It allows a bidder to acquire up to 2 x 20 MHz of sub-1GHz spectrum and up to 2 x 30 MHz of 1800 MHz spectrum, and this would seem to be sufficient spectrum for an operator to deploy a service and provide additional capacity in highly populated areas.

3.3.4 A simple fixed cap versus weighted cap

Another issue that ComReg considered was whether the overall cap should be applied as a simple fixed cap or as a weighted cap, whereby the size of the cap would vary depending upon the type of spectrum bid for.

One advantage of a weighted cap is that it would allow bidders to trade off their bids between the more valuable sub-1GHz spectrum and a greater quantity of 1800 MHz spectrum, and this may promote an efficient auction outcome. However, the relative weights used for sub-1GHz and 1800 MHz bands may not reflect the exact relative value of the spectrum in these two bands and this could lead to the distortion of bidder preferences for spectrum for reasons that relate only to the auction design.

Applying a weighted cap would more than likely result in one of two adjustments to the simple cap proposed above, either:

i. An increase to the overall 2 x 50 MHz cap for bidders who bid only for 1800 MHz spectrum; and/or
ii. Reducing the spectrum cap of 2 x 30 MHz for a bidder who was awarded the maximum 2 x 20 MHz of sub-1GHz spectrum.

There are obvious disadvantages to each of these adjustments. Increasing the 2 x 50 MHz cap could result in one bidder winning close to, if not all, the 1800 MHz spectrum band. In addition, restricting bidders to less than 2 x 30 MHz of 1800 MHz spectrum might be too prescriptive and could automatically prescribe a symmetrical outcome. Neither of these two outcomes seems a more attractive approach than the simple fixed cap. For these reasons, ComReg proposes using a simple fixed spectrum cap and not a weighted cap.

3.3.5 ComReg's proposal on spectrum caps for a joint auction of 800, 900 and 1800 MHz spectrum

In summary, ComReg is therefore proposing a spectrum cap for the duration of the competition as follows:

- An overall spectrum cap of 2 x 50 MHz; and
- A sub-1GHz spectrum cap of 2 x 20 MHz (as proposed in Consultation 10/71).

Q.2. Do you agree with ComReg's proposal to set an overall cap of 2 x 50 MHz for the joint award including the 2 x 20 MHz sub-1GHz spectrum cap that was proposed in Consultation 10/71? Please provide reasons for your view.

3.4 Temporal Lots

In Consultation 10/71, ComReg proposed the use of two temporal lots for the packaging of spectrum in the sub-1GHz band due to the different expiry dates of GSM 900 MHz licences.

The start date of the first time slice is proposed to be early 2013 and the start date of the second time slice corresponds with the licence expiry date of Meteor's GSM 900 MHz licence. This section now considers the appropriate temporal packaging for a joint award including the 1800 MHz band.

Before discussing this issue in depth, it is worthwhile to reiterate some of the reasons put forward by ComReg for its temporal lot proposal for the 800 MHz and 900 MHz bands in Consultation 10/71, as they are also relevant in the present context. ComReg proposed the same temporal lot packaging for the 800 MHz and 900 MHz bands in Consultation 10/71 to increase the efficiency of the proposed auction, as it would provide bidders with increased flexibility and choice to allow them to pursue more refined and diverse strategies.

With the proposed inclusion of the 1800 MHz band, and in light of the possibility that a bidder might be prepared to switch from sub-1GHz to 1800 MHz spectrum in response to price differentials, it therefore appears logical that the same temporal lot packaging should apply to all bands in the joint award. This would facilitate such flexibility and switching and therefore should increase the efficiency of the auction.

The temporal lots proposed in Consultation 10/71 are based upon the expiry dates of the GSM 900 MHz licences. As discussed earlier, there are currently three existing GSM licensees in the 1800 MHz band and, while each of the existing GSM 1800 MHz licences have 15 year durations, the expiry dates of the GSM 1800 MHz licences differ. Two of these licences (Vodafone and O2) are due to expire on 31 December 2014, whilst the other licence (Meteor) is due to expire on 12 July 2015. Whilst the licence expiry date of Meteor's GSM 900 MHz and 1800 MHz licences is the same and therefore facilitates the same temporal lot across the sub-1GHz and 1800 MHz bands, the earlier expiry of Vodafone's and O2's respective GSM 1800 MHz licences raises a timing issue which is discussed in Section 3.5 below.

3.4.1 Common start date for all liberalised licences

The first issue in relation to the temporal packaging of the 1800 MHz spectrum band is to set a start date for all new licences issued. Currently there is 2 x 31.4 MHz of unassigned spectrum in the 1800 MHz band. In theory at least, ComReg could issue new licences for this unassigned spectrum in 2011.

ComReg has previously considered a similar issue in relation to the 900 MHz band. In light of ComReg's statutory functions, objectives and duties, ComReg came to the preliminary view that the joint availability of the sub-1GHz spectrum represents a better approach than the staggered release of the 900 MHz band followed later by the release of the 800 MHz band.[18] In Consultation 10/71, ComReg noted that the joint availability of all sub -1GHz spectrum would have the following benefits:

i. It would avoid potential distortions to competition from asymmetric access to liberalised spectrum;
ii. It would avoid the risk of distortions and inefficiencies within the auction due to heterogeneity of licence lengths in the first time period; and
iii. It would provide a time period for transitional and preparatory activities to take place prior to a common licence commencement.

[18] ComReg's analysis of this issue is set out in Section 2.4.4 of Consultation 10/71.

ComReg notes that many of these factors are also relevant in the context of the 1800 MHz band. In particular:

i. Allowing asymmetric access to liberalised 1800 MHz would raise the possibility of distorting competition in downstream markets;
ii. Homogenous lots in the joint award allow bidders increased flexibility and choice in switching their preferences between bands. This would allow bidders to pursue more refined strategies and increases the efficiency of the auction. Overall the risk of distortions within the auction is reduced with homogenous lots; and
iii. Given that there are existing licences in the 1800 MHz, it is envisaged that a certain degree of transitioning would be required following the joint award in order for existing and new licensees to align their spectrum holdings to their new locations. (The issue of transitioning is discussed further in Section 3.6 of this chapter and in Chapter 4 of this document). The present availability of unassigned spectrum in the 1800 MHz band could assist the timely implementation of transitional activities. This is particularly relevant for the spectrum blocks currently occupied by the GSM 1800 MHz licences, as transitioning activities for these licensees would need to be completed before these blocks could become available for liberalised use.

In addition, and in light of ComReg's proposed issue of preparatory licences for winners of liberalised 1800 MHz rights of use (as set out in Chapter 4 of this document), ComReg considers that any adverse effects of aligning the availability of liberalised spectrum in the three bands to the same date to be small relative to the likely advantages.

3.4.2 ComReg's proposal

Taking all the above into account, ComReg considers that, on balance, the joint availability of 1800 MHz spectrum with sub-1GHz spectrum is reasonable, appropriate and justified in the context of ComReg's statutory functions, objectives and duties.[19]

3.4.3 Temporal lots for the joint award

The second issue to consider in relation to temporal lots is the timing of these lots. This issue has also been considered by DotEcon in Section 2.3 of its report (see ComReg Document 10/105a). Given the different licence expiry dates of GSM 1800 MHz licences, there appear to be two options available to ComReg:

a) Issue licences based on 3 temporal lots:
    1. Early 2013 - 31st December 2014;
    2. 1st January 2015 – 12th July 2015; and
    3. 13th July 2015 – 12th July 2030; or
b) Issue licences based on 2 temporal lots exactly mirroring the sub-1GHz proposal:
    1. Early 2013 – 12th July 2015; and
    2. 13th July 2015 - 12th July 2030.

[19] ComReg is cognisant that the date of Analogue Switch Off ("ASO"), and therefore the availability of the 800 MHz band, is contingent on factors external to it, including the widespread availability of the other television platforms to replace the analogue terrestrial television service and the awareness of consumers of these alternatives. ComReg is committed to providing as much regulatory certainty as possible on the availability of the 800 MHz band and will endeavour to keep stakeholders updated and informed on this issue, and any contingency plans to address availability delays, throughout this process.

In order for 1800 MHz lots to be substitutable with 800 MHz and 900 MHz lots, 3 temporal lot periods would be required across all the spectrum bands in the proposed auction. DotEcon's analysis indicates that the 3 temporal lot approach would lead to considerably increased complexity relative to the 2 temporal lot approach. It would significantly increase the different combinations of bids that bidders could make, and would therefore increase the complexity for bidders deciding how to bid. In addition, the addition of a third temporal lot may lead to additional transitional issues such as if a bidder was required to change frequencies between the second and third temporal lots.

In contrast, the 2 temporal lot approach, mirroring the temporal lots proposed for sub-1GHz spectrum, has a number of benefits. It would:

i. Allow bidders to switch between all three bands during the auction process more fluidly;
ii. Avoid the additional complexity across three bands that would otherwise arise from the introduction of a third temporal lot; and
iii. Avoid the possibility of additional transitional issues that would otherwise arise from the introduction of a third temporal lot.

However, the 2 temporal lot approach also presents a difficulty in the scenario where Vodafone and O2 win licences in the second time slot and they choose not to avail of the proposed 1800 MHz early liberalisation option (see section 3.7 below). This is due to a 6½ month difference between the expiry date of Vodafone's and O2's respective GSM 1800 MHz licences and the proposed commencement date of liberalised 1800 MHz licences in the second temporal lot (13 July 2015). This issue is discussed in detail below in Section 3.5.

3.4.4 ComReg's proposal

Taking all of the above into account, ComReg considers the two temporal lot approach to be the better option by which to meet ComReg's statutory objectives and therefore proposes to use this approach in the joint award.

Q.3. Do you agree with ComReg's proposal to use two temporal lots as proposed for the sub-1GHz spectrum, namely early 2013 – 12th July 2015 and 13th July 2015 – 12th July 2030, in the joint award including the 1800 MHz band? Please give reasons for your view.

3.5 The possibility of Interim licences in the 1800 MHz band

Based on the proposed 2 temporal lot approach, there is a timing difference of approximately 6½ months between the expiry of Vodafone and O2's respective GSM 1800 MHz licences and the proposed commencement date of licences for the second temporal lot. This time difference needs to be considered.

ComReg firstly notes that no issues would arise if:

i. Vodafone and O2 did not acquire liberalised rights of use in the 1800 MHz band in the second time slice; or
ii. These licensees fully availed of the proposed early liberalisation option as set out in Section 3.7 of this document (i.e. obtained 2 x 15 MHz of liberalised 1800 MHz rights of use).

On the other hand, ComReg notes that issues relating to this timing difference could arise if Vodafone and/or O2 wished to continue to provide a GSM service in this 6½ month period and these operators:

i. did not avail of the proposed 1800 MHz early liberalisation option as set out in section 3.7 of this document; and
ii. did not acquire sufficient liberalised spectrum in the first temporal lot to allow them to continue to provide a GSM service during this 6½ month period.

The following discussion identifies whether there are likely to be any significant issues (such as in relation to continuity of GSM consumer services) arising in the latter scenario.

3.5.1 Implications of 6 ½ month gap

First, it is clearly not possible to conclusively determine this matter at this time as whether an issue arises in the first place is dependent on the outcome of the proposed auction.

As discussed in Section 3.3 above, the spectrum cap proposed for this joint award would allow an operator to obtain up to 2 x 50 MHz of spectrum subject to the 2 x 20 MHz sub-1GHz cap. Currently the existing GSM operators each have 2 x 21.6 MHz of spectrum (2 x 7.2 MHz in the 900 MHz band and 2 x 14.4 MHz in the 1800 MHz band) and the proposed spectrum cap would allow an operator to more than double its spectrum holdings. As such it is possible that Vodafone and O2 may have sufficient spectrum holdings, at the time the 6 ½ month gap arises, to address this timing difference issue.

However it is also possible that Vodafone and O2 may have a reduced availability of spectrum for GSM purposes during this 6½ month period. To inform ComReg's consideration of how an existing licensee could adapt to a reduced assignment of spectrum in the 1800 MHz band, ComReg tasked Red-M/Vilicom to analyse this issue (in similar fashion to their consideration of "Scenario 2" in the 900 MHz band) and their findings are discussed in Section 2.5 of their report (see ComReg Document 10/105a).

Red-M and Vilicom note there are a large number of approaches that could be adopted by an operator in response to a reduction in spectrum availability, and that relatively small changes in some of the input assumptions could result in large changes in the impact of the scenario on the operator. In addition they recognise there are an increased number of spectrum outcomes possible as a result of the joint award, as operators may have a mixture of 800 MHz, 900 MHz and 1800 MHz spectrum once the auction is complete. An operator's spectrum assignments can affect the input assumptions to a quantification process and these added complexities, together with the increased number of reduced spectrum possibilities at 1800 MHz (2 x 14.4 MHz to 2 x 10 MHz, 2 x 5 MHz or 2 x 0 MHz), and the lower 'scarcity factor' of 1800 MHz spectrum compared to 900 MHz, has led Red-M and Vilicom to the conclusion that it is not appropriate to attempt to quantify "Scenario 2" at this time.

These matters are clearly of relevance to the present discussion and particular attention is drawn to the fact that it is very difficult to identify, at this point in time, what the likely consequences would be of Vodafone and/or O2 not having access to GSM 1800 MHz spectrum rights of use between 31 December 2014 and 12 July 2015. Under ComReg's joint spectrum award proposals, there is scope for considerable changes in 800 MHz and/or 900 MHz assignments for these operators in the period leading up to December 2014; and the nature of those changes will not be known until the award process is concluded.

That said, there would appear to ComReg, at this point in time, to be a number of factors that would suggest that administrative intervention, in the form of interim GSM 1800 MHz spectrum rights of use, is unlikely to be required. These factors include that:

i. As the relevant GSM 1800 MHz licences are not due to expire for approximately another 4 years, one could reasonably expect some or all of these operators' reliance upon this spectrum, for GSM capacity augmentation, to diminish significantly due to the natural migration of customers from GSM services to 3G services. Indeed, access to liberalised 800 MHz, 900 MHz and 1800 MHz spectrum may result in an accelerated migration of customers to 3G services;

ii. Furthermore, unlike the situation for these operators in the 900 MHz band, both Vodafone and O2 would be in a position to acquire spectrum rights of use considerably in advance of licence expiry to avoid potential consumer service issues altogether. Indeed, ComReg's proposed overall competition cap of 2 x 50 MHz would allow bidders to secure up to 2 x 50 MHz of liberalised 1800 MHz rights of use (or three times the existing GSM 1800 MHz rights of use) or up to 2 x 30 MHz of 1800 MHz if they were to acquire 2 x 20 MHz of sub-1GHz spectrum rights of use. Such rights of use would, under ComReg's proposal, be available for commercial use in early 2013;

iii. Unlike the situation for these operators in the 900 MHz band, and assuming that these operators did not acquire any 1800 MHz spectrum rights of use in the first time period, these operators would have 2 ½ years notice, from the proposed award in mid-2011 until licence expiry, to avoid any GSM consumer service issues using measures previously identified by ComReg; and

iv. There is considerably lower nationwide usage of the GSM 1800 MHz band when compared to the usage of GSM 900 MHz spectrum (the former currently being used primarily for GSM capacity augmentation in urban areas). As such, there is considerably smaller potential for overall GSM consumer service issues to arise relative to the 900 MHz band in absolute terms.

Nevertheless, and bearing in mind that the specific nature and extent of any issues arising during the relevant period will only become clear following the proposed spectrum award and closer to the time of licence expiry, ComReg considers that it would not be appropriate to entirely rule out the issue of interim rights of use (where justified in the context of ComReg's statutory functions, objectives and duties) and therefore does not discount considering future applications for GSM 1800 MHz interim rights for the relevant period.

Q.4. Do you agree with ComReg's approach in relation to the period between the expiry of Vodafone and O2's respective GSM 1800 MHz licences and the proposed commencement date of licences for the second "time slice" in the 1800 MHz band? Please provide reasons for your view.

3.6 Location of existing GSM assignments in the 900 MHz and 1800 MHz bands & Impact on proposed joint Award

As discussed earlier in this chapter, there are three existing GSM licences of 2 x 14.4 MHz in the 1800 MHz band. Figure 3 below depicts the location of these licences in the 1800 MHz band and shows that these licences are spread across 9 blocks (lots F to N).

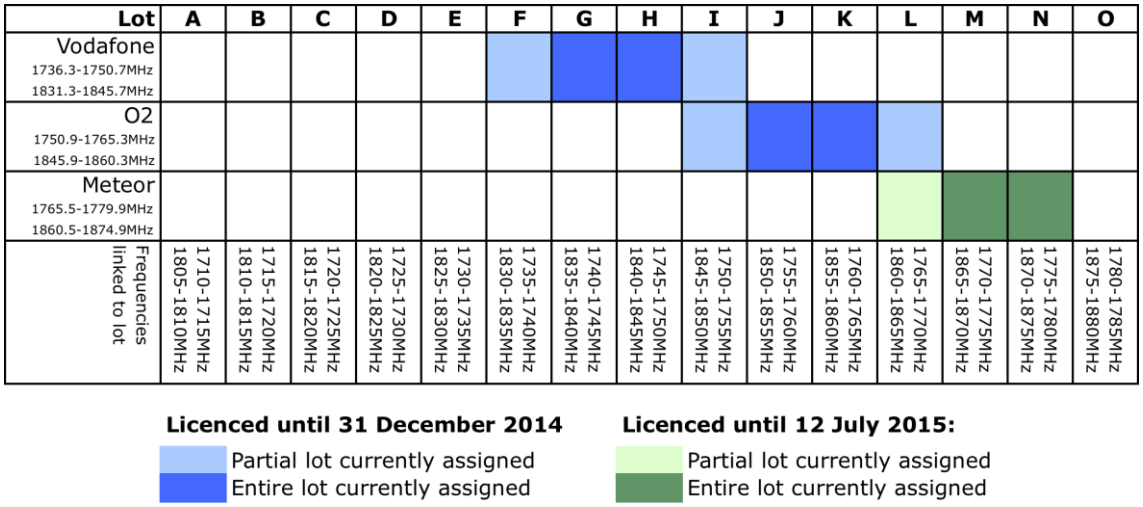

Figure 3: The 1800 MHz band plan

Similarly, there are existing licences in the 900 MHz band and Figure 4 below depicts the location of these licences in the 900 MHz band showing that the existing location of Meteor's licence is spread across 2 blocks (lots C and D).

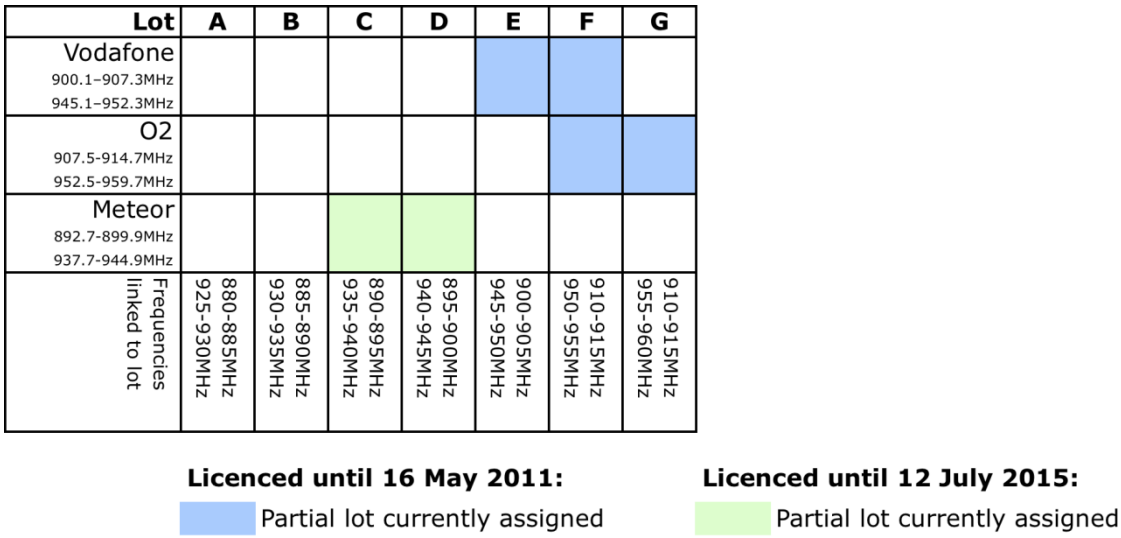

Figure 4: The 900 MHz band plan

In designing an award process that would include the 900 MHz and 1800 MHz bands, it is important to consider the location of the existing GSM spectrum assignments in these bands. In the first time slice, the location of existing GSM assignments raises a number of issues that impact on the proposed award process. In the proposed joint award, ComReg wishes to ensure that a number of factors are in place to ensure an efficient auction outcome:

i. Ensure that all blocks within a band are homogeneous and are available for electronic communication services in accordance with the requirements of EC Decision 2009/766/EC;

ii. Ensure that new licensees can obtain contiguous spectrum and ensure that existing operators can avail of the proposed early liberalisation option for partially shared blocks in the 1800 MHz band (i.e. Lots I and L).

These issues are discussed in turn below in relation to both bands.

3.6.1 Issue (1) Ensure that all blocks within a band are homogeneous and are available for electronic communication services in accordance with the requirements of EC Decision 2009/766/EC

The EC Decision on the 900 MHz and 1800 MHz bands[20] states that there must be a minimum carrier separation of 2.8 MHz between the centre frequencies of the closest carrier channels in a GSM network and a UMTS network, unless otherwise agreed via bilateral or multilateral agreements between neighbouring networks.[21]

In relation to the 900 MHz band, this issue was discussed in Consultation 09/99 and Section 5 of the accompanying DotEcon report (09/99c). It was noted that the location of Meteor's existing GSM 900 MHz assignment could give rise to co-ordination issues between Block D and adjoining blocks, as the centre frequency of Meteor's uppermost GSM channel in Block D is only 200 kHz from the edge of Block E. This could therefore also impact upon the proposed auction and the auction outcome.

In Chapter 14 of Consultation 09/99, ComReg highlighted that while it remained hopeful that any interference issues relating to Meteor's existing GSM assignment could be fairly and reasonably managed through inter-operator coordination and cooperation, ComReg sought to also provide regulatory certainty to all operators in the event that it did not. ComReg noted the need to take appropriate steps to ensure that the proposed auction delivers an efficient outcome across the entire 900 MHz band and, depending on the outcome of the above events, ComReg indicated it may be appropriate to shift Meteor's assignment in Block C and D down by 200 kHz.

ComReg consulted on this issue in Consultation 09/99 and, in general, most respondents agreed with ComReg's analysis of the issue and its proposed measure. ComReg intends to finalise its view on this issue in due course having regard to all responses received.

In relation to the 1800 MHz band, a similar issue arises with the location of Meteor's existing GSM 1800 MHz assignment. The centre frequency of Meteor's uppermost GSM channel in Lot N is only 200 kHz from the edge of Block O. This could give rise to potential interference issues and, if not addressed, prevent the use of block O for UMTS. As ComReg wishes to ensure that all blocks within a band are homogeneous and are available for electronic communication services in accordance with the requirements of EC Decision 2009/766/EC, the location of Meteor's current 1800 MHz assignment needs to be addressed. ComReg considers this issue in more detail below in Section 3.6.3 which discusses the assignment phase of the proposed auction.

3.6.2 Issue (2) – Ensure that new licensees can obtain contiguous spectrum and ensure that existing operators can avail of the proposed early liberalisation option for partially shared blocks in the 1800 MHz band (i.e. Lots I and L)

[20] EC Decision 2009/766/EC of 16 October 2009 on the harmonisation of the 900 MHz and 1 800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community.

[21] ComReg is aware that amendments to allow the use of LTE and WiMAX technologies is currently under discussion, and co-ordination requirements similar to that of UMTS are being discussed in relation to the LTE and WiMAX technologies. See chapter 2 of this document.

Ensuring that a new licensee can obtain contiguous spectrum in a spectrum band has a number of advantages which serve to ensure the efficient use and effective management of spectrum. From an operator's perspective, contiguous spectrum is attractive as it results in fewer co-ordination boundaries with neighbouring networks. This can provide the operator with increased flexibility and allow it to use its spectrum more efficiently. Similarly, from a spectrum management perspective, the ability to assign contiguous blocks of spectrum promotes the efficient management and use of spectrum by reducing the amount of inter-operator co-ordination required.

In the proposed joint award, and as discussed in Section 3.3 above, ComReg proposes to set two competition spectrum caps, an overall spectrum cap of 2 x 50 MHz, including a sub-1GHz cap of 2 x 20 MHz.

In the case of the 900 MHz band, given (a) the proposed 2 x 20 MHz sub-1GHz competition spectrum cap and (b) the location of Meteor's existing assignment, this could give rise to fragmented spectrum blocks if one bidder were to win 2 x 20 MHz of 900 MHz spectrum in the first time slice. [22] As noted by DotEcon in section 4.1 of its report (see ComReg Document 10/105a), the probability of this outcome in the first time slice is small and so there appears to be only a low risk of spectrum fragmentation in the 900 MHz band as a result of the location of Meteor's existing GSM 900 Licence.

In the 1800 MHz band, however, given the existing locations of the GSM 1800 MHz assignments and the fact that there are two partially shared blocks, DotEcon considers it likely that fragmentation of spectrum assignments may occur unless appropriate measures are put in place. There are three existing GSM assignments in this band and two of the spectrum blocks (Lots I and L) are partially shared by two operators. The partial sharing of a spectrum block complicates any early liberalisation mechanism (see Section 3.7 below) as, under current proposals, the liberalisation of these partially shared blocks would only be possible if both operators chose to liberalise their spectrum in this block. In addition, the proposed competition spectrum cap would allow a bidder to win up to 2 x 50 MHz of 1800 MHz spectrum (as opposed to a maximum of 2 x 20 MHz of sub-1GHz spectrum) and it would not be possible to accommodate this maximum spectrum cap given the existing locations of GSM 1800 MHz assignments.

ComReg's proposal

In light of the issues identified above, ComReg believes there are substantial benefits to be obtained from designing the auction to ensure that new licences will comprise of contiguous spectrum assignments, as otherwise there is a risk of inefficient spectrum and auction outcomes, particularly if the current locations of existing GSM assignments are retained within both the 900 MHz and 1800 MHz bands.

Q.5. Do you agree with ComReg's view that there are important benefits to be obtained from designing the auction to ensure that new licences will comprise of contiguous spectrum assignments in the first time slice? Please provide reasons for your view.

[22] There are two other cases in which contiguous assignments for winners in the 900 MHz band cannot be guaranteed: if there are two winners of 2x15MHz spectrum and Meteor retains block C; or if there are three winners of 2x10MHz and Meteor retains block D. In both cases Meteor would need to be one of these winners and it seems unlikely that it would put a high value on retaining the problematic block and not receiving its new frequencies contiguously next to or around this block. Therefore these two cases are much less problematic than the case of one winner of 2x20MHz of 900 MHz spectrum.

3.6.3 Auction design: Assignment approaches

ComReg has considered two alternative approaches to the assignment of spectrum in the auction to ensure that licences can obtain contiguous spectrum assignments. This issue is discussed by DotEcon in Section 4.2 of its report (see ComReg Document 10/105a).

Approach 1 – "All or nothing"

An "all of nothing" approach to the assignment of spectrum would mean that if an existing licensee chose to opt for early liberalisation of its current licence in the 1800 MHz band, that licensee would have to opt to liberalise all of its existing assignment and would not be permitted to liberalise a subset of its existing GSM 1800 MHz assignment. While this approach would remove a number of fragmented/non-contiguous outcomes from the range of potential auction outcomes, it has a number of disadvantages, namely:

i. it would be incomplete in addressing the potential for fragmentation of spectrum as fragmented outcomes would still be possible and,
ii. assuming that one or more existing licensees choose not to exercise this early liberalisation option, this approach would impose additional constraints on any early liberalisation mechanism.

Approach 2– "Full assignment round"

A "full assignment round" approach would mean that every lot in the 1800 MHz band would be included in the assignment round of the proposed auction, including those lots currently occupied by the existing licensees, irrespective of whether they chose any early liberalisation option or not.

In the case of the 1800 MHz band, the advantage of this approach is that it ensures that contiguous spectrum would be awarded in the proposed auction. This is possible as the full band would be available in the first time slice for assignment purposes and would therefore allow ComReg to provide contiguous spectrum options to all successful bidders in the assignment round. This would alleviate the possibility of an inefficient auction outcome resulting from value differences of bidders for contiguous and non-contiguous spectrum assignments.

Using this approach could however result in a licensee being required to move to a different part of the band and thereby incur relocation costs. Relocation costs are discussed in Section 3.6.4 below. It is noted, however, that the assignment stage also offers existing licensees the opportunity to bid to stay in its current location and avoid incurring such relocation costs. This choice rests with each individual licence holder.

Furthermore, and assuming that existing GSM 1800 MHz licensees obtained spectrum in the second time slice, as a result of the assignment stage for the second time slice it appears inevitable that one or more GSM operator(s) would be required to re-locate their spectrum holdings to another part of the band in advance of the proposed start date of the second time slice in July 2015. As noted by DotEcon, the "full assignment round" approach basically brings forward the relocation activities to before the start date of first time slice in early-2013. In this context, it therefore would not introduce any new costs to an existing GSM operator which won spectrum in the second time slice. Instead, these costs would be incurred up to 2½ years earlier than otherwise required. In addition, this approach would also have the advantage of providing winners of the auction with contiguous spectrum at an earlier date which could result in more efficient spectrum planning and use.

Overall, it would appear to ComReg that the benefits of the full assignment round approach would likely outweigh the costs and, importantly, it is noted that the relocation costs involved in this approach would likely be incurred by these licensees in any event (on the reasonable assumption that these licensees obtain liberalised 1800 MHz spectrum rights of use in the second time slice). Accordingly, ComReg therefore proposes to implement the "full assignment approach" in relation to the 1800 MHz band.

In the case of the 900 MHz band, ComReg notes that there are similar reasons for adopting the full assignment round approach, to address Meteor's existing GSM 900 MHz assignment. As in the case of the 1800 MHz band, the inclusion of all 900 MHz spectrum in an assignment round would have the benefit of increasing the number of potential outcomes that could result when all bidders are assigned contiguous spectrum and avoids any auction outcomes resulting from value differences for contiguous and non-contiguous spectrum. While these benefits are likely to be smaller than those generated in the 1800 MHz band, they are nonetheless material.

On the downside, the imposition of the full assignment approach to the 900 MHz band would potentially require Meteor to relocate to a different part of the 900 MHz band and incur relocation costs. While the issue of relocation costs and potentially compensatory measures are in the next section discussed below, similar to the 1800 MHz band, it would appear reasonable to assume that Meteor would seek rights of use for the 900 MHz band in the second time slice and, if successful, it is likely that some relocation would likely be incurred in any event. In such circumstances, adopting the full assignment approach in the 900 MHz band would, in effect, bring forward the relocation activities of Meteor to before the start date of the liberalised licences in the first time slice, as opposed to before the start date of the second time slice.

ComReg's proposal

Given the above and the benefit of having a consistent approach across spectrum bands, ComReg sees merit in implementing the full assignment round for both the 900 MHz band and the 1800 MHz band.

Q.6. Do you agree with ComReg's proposal to introduce a "full assignment round" into the first time slice of the 900 MHz and 1800 MHz bands? Please give reasons for your view.

3.6.4 Estimated Relocation Costs

The following section discusses the likely costs associated with relocation activities within the 1800 MHz and 900 MHz bands which could occur as a result of the proposed "full assignment round" discussed above or another required relocation mechanism.

To assist its consideration of relocation and retuning matters, ComReg commissioned expert technical advice from Red-M Wireless Limited ("Red-M") and Vilicom Limited ("Vilicom"), to detail the process steps and estimated timeframes that could be associated with various transitional scenarios in both the 900 MHz and 1800 MHz band. This has resulted in two technical reports[23] which have informed ComReg's consideration of the issues.

[23] Document 10/71c (Red-M/Vilicom Report on the 900 MHz band) & Document 10/105b (Red-M/Vilicom Report on the 1800 MHz band)

In the case of the 1800 MHz band, the cost of relocating existing GSM assignments to another part of the 1800 MHz band is considered by Red-M and Vilicom in their report (10/105b). This report suggests that the relocation engineering costs for a 'typically' sized Irish network[24] would be in the order of €240,000, with the worst-case estimate of time required to carry out such relocation in the order of 5 months.[25] In light of ComReg's proposal to hold a joint award in mid-2011, it is noted that there would be sufficient time for existing GSM 1800 MHz licensees to carry out such activities considerably in advance of the estimated early-2013 start date for liberalised licences in the first time slice. This report studied the worst case scenario of a full relocation as opposed to a partial relocation or retune which could be somewhat less costly.

In the case of the 900 MHz band, the likely costs associated with relocation activities in the 900 MHz band are discussed in Red-M/Vilicom's previous report (ComReg Document 10/71c). In Scenario 1 of that report (i.e. a relocation to another part of the band), the study estimates that, for a typical network, the costs would be in the order of €500,000. Red-M/Vilicom also considered the likely costs associated with relocating Meteor's assignment by 200 kHz (Scenario 3) and the cost was estimated to be €300,000.

3.6.5 Potential Compensatory Measures for Required Relocation

3.6.5.1 Measures proposed in Consultation 09/99

ComReg discussed the issue of potential compensation in Consultation 09/99 and ComReg was of the view that compensation may be appropriate in certain circumstances.

In Consultation 09/99 ComReg discussed the possibility of moving Meteor's existing 900 MHz GSM assignment by 200 kHz. ComReg sought views on the nature of any relocation costs associated with such a move and whether and, if so how, Meteor should be fairly and reasonably compensated for any such costs, having particular regard to ensuring that costs would be objectively justified, proportionate and independently verifiable.

ComReg received four responses to this issue (from the four MNOs) which can generally be summarised as follows:

i. On the issue of likely costs, Vodafone, O2 and H3GI all noted that an accurate estimate of the costs could only be provided by the licensee itself and H3GI added that it would be appropriate for these costs to be independently verified. It is noted that Meteor provided a confidential estimate of such costs. O2 noted that *"the adjustment required is relatively minor, and it is possible that the costs involved are negligible".* However, O2 also added that if the costs were not negligible, *"ComReg could consider applying a discount on the auction fee for the relevant amount."*
ii. There was general support of the principle of providing fair and reasonable compensation in the event of a required relocation; and

[24] A 'typically' sized Irish network is assumed to have around 1600 2G sites and 1000 3G sites, with 2G/3G site sharing. It is assumed that of the 1600 2G sites in the network, 30% or 480 are equipped with 1800 MHz equipment

[25] This report also considers slight variations on this scenario. "An operator who had to relocate twice in quick succession under the 'absolute worst case' scenario would see increased engineering costs estimated at approximately €255,000. If, on the other hand, the 1800 MHz relocation project followed closely after an identical project to relocate the same operators 900 MHz network, then it should be possible to reduce the time required for the planning activity to around one month. The costs associated with the reduced project could be reduced to around €130,000."

iii. It was generally considered that any compensation provided should be via the auction (e.g. a discount on the auction fee) and the costs should not be funded directly or indirectly from other operators.

In relation to the first bullet point, and as noted above, Red-M/Vilicom estimate the cost of relocating Meteor's assignment by 200 kHz to be €300,000 (see Document 10/71c). Having had the benefit of considering Meteor's confidential estimate, Red-M/Vilicom noted that Meteor's estimate is more likely to include figures that reflect the actual cost base of Meteor, and that Meteor's figure would appear, ostensibly at least, to be a reasonable estimate of the actual cost of this scenario.

In relation to the second point, ComReg notes that there was general support for fair and reasonable compensation in the event of a required relocation. These comments were submitted in relation to ComReg's previous proposal, as set out in Consultation 09/99. As discussed above, ComReg's proposed "full assignment round" now provides a new context for required relocations. The section below discusses the ComReg's proposed compensatory measures in this regard.

3.6.5.2 ComReg's proposed measures in the context of a Full Assignment Round

As discussed in section 3.6.3 above, in certain circumstances, it is ComReg's view that the full assignment round would not introduce any new relocation activities to an existing GSM operator. Instead it would bring forward these relocation activities to before the start date of first time slice in early-2013.

This circumstance is likely to occur in the case of an existing licensee who acquires spectrum in the second time slice but did not avail of the early liberalisation option in the first time slice. In these circumstances, it is ComReg's view that a required relocation under the full assignment round would not introduce new relocation costs (as these relocation costs would be incurred by the licensee in any event just at a later date) and in this context ComReg's is of the preliminary view that it would not be appropriate to grant compensation.

However ComReg is of the preliminary view that compensation measures may be appropriate for relocation costs in other circumstances. For example if an existing GSM licensee did not win spectrum in the second time slice and did not avail of the early liberalisation option in the first time slice, it would appear reasonable that such licensees are appropriately compensated, as this licensee is likely to incur relocation costs that otherwise would be avoided. Any compensation would only be based on relocation costs which were objectively justified, proportionate and independently verified.

Q.7. Do you consider it appropriate that ComReg would provide compensation to a GSM licensee, in either the 900 MHz or 1800 MHz band, for required relocation costs that otherwise would have been avoided? Please give reasons for your view.

3.7 Early Liberalisation option for existing GSM Licensees & Potential Rebate for Residual Licence Period

3.7.1 Early Liberalisation option

Existing licences in the 900 MHz and 1800 MHz bands allow for GSM-use only. In previous consultations[26], ComReg considered the liberalisation of these existing GSM licences and set out its view that the most appropriate approach is to liberalise the bands via an open and competitive award process.

In the case of the 900 MHz band, Section 12.2.4 of Consultation 09/99 presented an early liberalisation option whereby an existing GSM 900 MHz licensee (Meteor) would be given the opportunity of obtaining a liberalised 900 MHz licence in the auction at the same time as other bidders seeking such licences. ComReg saw merit in this option as it would increase the possibility of achieving earliest liberalisation of the entire band in a manner that would minimise distortions that may arise due to asymmetric access to liberalised spectrum.

In the case of the 1800 MHz band, ComReg believes that it is also appropriate to consider the early liberalisation option. Section 3.3 of the DotEcon report (ComReg Document 10/105a) discusses a potential mechanism by which an existing licensee could obtain a liberalised 1800 MHz licence for some or all of its current 1800 MHz assignments via a competitive award process.

DotEcon highlights that while an existing GSM 1800 MHz licensee can choose to release a subset of its GSM spectrum assignment, there should be certain constraints around this release. An existing licensee would need to release spectrum in a manner compatible with the released spectrum being reassigned using 2 x 5 MHz blocks.

In addition, any un-liberalised GSM spectrum retained by the existing GSM licensee would be required to comply with the technical requirements as set down in the EC Decision and the GSM raster plan and these constraints may affect the total amount of GSM channels usable in the un-liberalised spectrum block.[27]

Similar to the proposal in the 900 MHz band, DotEcon highlights that the early liberalisation offer to release spectrum is linked to the corresponding purchase of liberalised spectrum in the auction, and therefore there is no risk that the bidder could end up with less spectrum in the 1800 MHz band in the first time slice than it currently holds.

ComReg's proposal

Given the fact that the early liberalisation option would provide a reasonable and proportionate means by which to achieve earliest liberalisation of the entire band in a manner that would minimise distortions, and in light of responses received to Consultation 09/99, ComReg considers that the early liberalisation option should be provided in the proposed auction. In this regard, ComReg believes that the same early liberalisation rules should, in the

[26] The issues surrounding ComReg's concern over liberalisation of existing 900 MHz licences was discussed in Section 5.1.3 of Consultation 09/14, Section 8.1.3 of Consultation 09/99 and Section 2.4.4 of Consultation 10/71.

[27] This issue is discussed in Section 2 of the Red-M & Vilicom report (10/105b) where it highlights the fact that the maximum number of usable GSM channels in a 2 x 5 MHz block could vary from 22 channels to 24 channels depending on whether there is co-ordination or not. In line with the existing legislation, the fees for any spectrum retained would be calculated using the number of usable channels, noting that a GSM licensee could also opt to retain fewer GSM channels than the maximum allowed. E.g. it could opt to retain 2 x 4.0 MHz of spectrum or 20 GSM channels.

interests of the efficient use and effective management of spectrum, apply for both the 900 MHz and 1800 MHz bands and ComReg is therefore minded to adopt the early liberalisation approach as discussed above.

Q.8. Do you agree with ComReg's proposal to adopt an early liberalisation approach for both the 900 MHz and 1800 MHz bands? Please provide reasons for your view.

3.7.2 Potential Rebate for Residual Licence Period

If an existing GSM licensee avails of the early liberalisation option and thereby releases some or all of their existing GSM spectrum assignments at either 900 MHz or 1800 MHz in order to bid for it on a liberalised basis in the joint competition, the licensee is potentially foregoing the residual term of this spectrum for GSM purposes. In such instances it may be appropriate to provide a rebate in respect of the residual term foregone.

In the context of the 900 MHz band, this issue is discussed in section 12.2.4 of Consultation 09/99. ComReg proposed to offer a rebate to Meteor for the loss of the residual term of its 900 MHz spectrum assignment, in the event that it returned its current 900 MHz spectrum assignment, and contingent on it winning liberalised 900 MHz spectrum.

As set out in Consultation 09/99, the calculation of the proposed rebate was based upon the original purchase price of the licence, adjusted for inflation (using CPI[28]), and the amount of spectrum being released, and the remaining term of the licence.

In response to Consultation 09/99, various views were expressed in support and against the possibility of a rebate to Meteor. A number of respondents agreed in principle with a rebate and reasons cited by these respondents were that:

i. The principle of a rebate was objective and justified;
ii. It was appropriate to base a rebate on the original purchase terms; and
iii. A rebate would incentivise early liberalisation.

On the other hand, a number of respondents disagreed with the principle of a rebate and the reasons cited by these respondents included that:

i. It was not objectively justified or necessary in the context of the 900 MHz band to provide a rebate, as there are sufficient incentives for the incumbent to liberalise;
ii. A rebate offered an unfair advantage in the competition and that it could therefore be considered a form of state aid; and
iii. It would allow Meteor to obtain a liberalised 900 MHz spectrum licence cheaper.

ComReg's proposal

For the reasons as set out in Consultation 09/99, and having considered the views of respondents, ComReg remains of the preliminary view that it would be appropriate to issue a rebate for the residual time remaining on a GSM licence if an operator was to opt for early liberalisation, and that this should apply to both 900 MHz and 1800 MHz GSM licensees.

ComReg is of the preliminary view that the calculation of the proposed rebate should be on the basis of the methodology as set out in Consultation 09/99. Table 2 below presents ComReg's proposed rebates per operator, based on November 2010 prices. The figures in this

[28] Based on consumer price index ("CPI") data published by the Central Statistics Office www.cso.ie

table are based on the assumption that an operator avails of the early liberalisation for its full spectrum assignment in either the 900 MHz and/or 1800 MHz bands. Rebates for the early liberalisation of partial spectrum assignments would be calculated on a pro-rata basis.

Table 2: Proposed Rebate for an operator who choose to avail of the early liberalisation option for its full spectrum assignment

Operator	**Spectrum Band & Assignment & Start Date**	**Original Access fees paid**	**Proportion of Licence foregone**	**Proportion of Access fee foregone** (€1= IR£0.787564)	**CPI Adjustment** (from start date of GSM licence to Nov 2010)	**Proposed Rebate**
Vodafone	1800 MHz 2 x 14.4 MHz Jan 2000	IR£5.69m[29]	2 years/ 15 years	€963,308	132.8%	€1,279,273
O2	1800 MHz 2 x 14.4 MHz Jan 2000	IR£5.686m[30]	2 years/ 15 years	€962,631	132.8%	€1,278,374
Meteor	1800 MHz 2 x 14.4 MHz July 2000	IR£7.5m[31]	2.5 years/ 15 years	€1,587,173	127.8%	€2,028,407
Meteor	900 MHz 2 x 7.2 MHz July 2000	IR£3.75m[32]	2.5 years/ 15 years	€793,586	127.8%	€1,014,203

Q.9. Do you agree with ComReg's "rebate" proposal for 900 MHz and 1800 MHz GSM licences? Please provide reasons for your view.

3.8 Spectrum Fees – Minimum Price for 1800 MHz spectrum

In its previous consultation documents relating to sub-1GHz spectrum (Consultations 09/99 and 10/71), ComReg set out some specific aims for setting minimum price levels for the proposed auction. These are as follows:

i. To deter frivolous bidders without genuine business cases whose participation may prolong the auction process and waste resources;
ii. To ensure that the administrative cost of the auction process is recovered;
iii. To disincentivise and guard against uncompetitive auction outcomes, including that arising from anti-competitive collusive behaviour of potential bidders;
iv. Not setting the minimum price so high that the risk of choking off efficient demand would be significant; and
v. Ensuring the efficient use of spectrum.

ComReg engaged its advisors DotEcon to assist in setting a minimum price level for sub-1GHz spectrum. DotEcon carried out a benchmarking analysis to estimate an appropriate

[29] See ComReg Press Release PR070999a

[30] See ComReg Press Release PR070999a

[31] See ComReg Press Release PR190698

[32] See ComReg Press Release PR190698 and ComReg Document 01/104

minimum price for the 800 MHz and 900 MHz bands, in accordance with these objectives.[33] The result of DotEcon's benchmarking analysis indicated that a minimum price for a 2 x 5 MHz 15-year licence of sub-1GHz spectrum within the range of €18m to €26m was a conservative lower bound estimate of the market value of sub-1GHz spectrum and reflected the aims identified above. Within this range, ComReg has proposed a minimum price of €25m, in May 2010 prices, as set out in Consultation 10/71. ComReg notes the views expressed by respondents on the proposed minimum price for sub-1GHz spectrum and will address these matters in the forthcoming response to consultation and draft decision documents.

3.8.1 Relativity analysis for 1800 MHz spectrum

DotEcon has also assisted ComReg in setting a minimum price for 1800 MHz spectrum. DotEcon considers that using the same benchmarking approach adopted for sub-1GHz minimum price is not appropriate for 1800 MHz spectrum, as the data set used for this analysis would not have ensured a lower bound estimate of the true market value of 1800 MHz. As a consequence, DotEcon adopted an alternative approach to setting a minimum price for 1800 MHz. This approach is set out in detail in DotEcon's report (ComReg Document10/105a) and is summarised below.

DotEcon's approach for setting a minimum price for 1800 MHz spectrum is based on the generally accepted premise that the 800 MHz and 900 MHz spectrum bands are more valuable than higher frequency spectrum such as 1800 MHz in the provision of mobile services. There are a number of reasons for this, most important of which is the network cost savings associated with the superior propagation characteristics and more effective in-building coverage of sub-1GHz spectrum.

There is no reliable data on the value of liberalised 1800 MHz spectrum. For this reason, DotEcon adopted a 'relativity' analysis to set an appropriate minimum price for 1800 MHz by estimating the value differential between sub-1GHz spectrum and 1800 MHz spectrum. The aim of DotEcon's approach is to determine the relative value of sub-1GHz and 1800 MHz spectrum. Having determined this relative value, DotEcon then calculated a minimum price for 1800 MHz by applying this relative value to the minimum price estimated for sub-1GHz spectrum.

DotEcon determined the relative value of sub-1GHz and 1800 MHz spectrum by considering international benchmarks using a similar data set to that used for sub-1GHz spectrum, including:

i. International benchmark of auctions of different spectrum bands in a simultaneous award; and
ii. International benchmark of spectrum awards in the same country, but at different times.

On the basis of its analysis, DotEcon found that the relative band value of 1800 MHz to sub-1GHz spectrum ranged from 45% to 60%. DotEcon performed consistency cross-checks of these results against a number of technical studies that model network costs using different frequency bands and found that the proposed minimum price for 1800 MHz spectrum

[33] This analysis was published in two reports, Document 09/99c published in December 2009 and a follow-up report, Document 10/71b, published in September 2010. The follow-up report included an update to the benchmarking exercise to take into account the consultation responses from Consultation 09/99 and additional data which had become available. This report also accounted for the potential inclusion of the 800 MHz spectrum band in the same auction process.

accorded with the findings of these studies. Based on the proposed range for sub-1GHz spectrum for 2 x 5 MHz of spectrum, DotEcon suggest a minimum value for 1800 MHz at 50% of the minimum price range for a sub-1GHz 2 x 5 MHz block of spectrum.

ComReg is of the view that the approach adopted by DotEcon for estimating a conservative lower bound estimate for 1800 MHz spectrum and recommendation in light of this approach to be reasonable and appropriate in the circumstances. Factors informing this view include:

i. The main purpose of the minimum price exercise undertaken by DotEcon is to set a starting point for the auction. The final outcome of the auction should not be impacted by this starting point unless there is no excess demand. The proposal of setting a minimum price for 1800 MHz at approximately 50% of the minimum price of sub-1GHz spectrum appears to be a reasonable starting point;
ii. As DotEcon note, the relativities between sub-1GHz spectrum and 1800 MHz spectrum only need to be approximately correct to be effective. If the relativities are somewhat different in reality, these will be reflected in the auction itself, as long as the minimum prices constitute conservative lower bounds to the actual market value of the respective spectrum, so that no efficient demand in either category will be choked off.

3.8.2 Structure of minimum price

DotEcon also provided advice on the appropriate structure of the minimum price for 1800 MHz lots, and previously in the case of sub-1GHz spectrum. As noted in previous consultations on sub-1GHz spectrum, annual Spectrum Usage Fees ("SUFs") are an effective measure to incentivise efficient use of spectrum and discourage spectrum hoarding. For these reasons, ComReg considers that SUFs would also be appropriate in the context of 1800 MHz fees. ComReg is aware of the views expressed by respondents in previous consultations (Consultations 10/71 and 09/99) on the proposed structure of the minimum price for sub-1GHz spectrum and will address these in the forthcoming response to consultation and draft decision documents.

In relation to the sub-1GHz spectrum, ComReg proposed that, in light of DotEcon's analysis and recommendation, the minimum price would be comprised of an upfront reserve price and annual SUFs on a 50/50 basis. ComReg was of the view that the proposed 50/50 split would be sufficient to ensure that participation in the auction will be limited to serious, credible bidders. Furthermore, assuming a discount rate of 10.2% (reflecting an industry operator's cost of capital[34]), the associated SUFs would be adequate to incentivise licensees to return unused or under-utilised spectrum especially when viewed over the long term.

ComReg is of the view that the same 50/50 split should be applied in the case of 1800 MHz as applying a different ratio in the 1800 MHz band within the same auction could risk distorting choices between bands on the basis of different payment terms, though this would be less important as auction prices rise above the minimum price level.

[34] The discount rate equates to eircom's Weighted Average Cost of Capital (see ComReg Document 08/35) and is used, in this context, as a proxy for the cost of capital of a telecommunications industry operator.

3.8.3 ComReg's proposal

In light of the above considerations, ComReg therefore proposes that the minimum price for 1800 MHz lots would be set at 50% of the proposed minimum price for sub-1GHz spectrum and consist of an upfront reserve price and annual SUFs on a 50/50 basis.

Additionally, while the issue of a deferred payment scheme and the indexation of SUFs and interests cost associated with such a deferred payment scheme were not explicitly raised in Consultation 10/71, it was discussed in Consultation 09/99. Responses to this consultation have been received and it is ComReg's intentions to finalise its view on the issue in due course having regard to the responses received.

Q. 10. Do you agree with the proposed methodology for setting licence fees for 1800 MHz spectrum? Do you agree with the proposed minimum price for 1800 MHz spectrum to be set at 50% of the proposed minimum price for sub-1GHz spectrum, split 50/50 between an upfront reserve price, and annual spectrum usage fees? Please provide reasons for your view.

3.9 Substitutability of 1800 MHz and sub-1GHz spectrum in the auction

In order to obtain the full benefits of including the 1800 MHz band in the same auction as the sub-1GHz spectrum, the auction should allow substitutability between the three spectrum bands.

Allowing substitutability has many benefits. As previously mentioned, it may be desirable for an operator to have access to some 1800 MHz spectrum to complement sub-1GHz spectrum holdings as, at a certain point, an operator may be prepared to fulfil its further spectrum needs taking into account the relative prices in each band. Allowing a bidder to switch its bids between the three spectrum bands would therefore provide considerable benefits in terms of providing flexibility and diversity of bidding strategies, etc. Additionally, allowing such swapping between bands as price information is revealed may allow an auction to reach a more efficient allocation than where substitution is not allowed, as such substitutability provides a level of flexibility within the auction that can be beneficial in ensuring that the resulting spectrum allocation across the bands is efficient.

On the other hand, substitutability can also provide scope for undesirable strategic behaviour, as for instance, a bidder may try to hide its real demand for relatively expensive lots by bidding on the relatively cheap lots. However, such strategic behaviour can be risky as any bid made at any point in the proposed auction could be potentially binding and a bidder would therefore risk winning undesired lots.

On balance, it is ComReg's view that substitutability of 1800 MHz and sub-1GHz spectrum in the auction should be allowed, and the proposed mechanics to enable this are discussed below.

3.9.1 Activity Rules & Eligibility Points in the Auction

In order to provide incentives for bidders to reveal information about their valuation through their bidding behaviour (which is the main reason for adopting an open auction format), bidders should be required to comply with activity rules that are set to encourage bidders to reveal their demand as the auction progresses. Without rules governing bidder activity there is the risk that bidders could act strategically, for example by 'hiding' their demand by not

bidding on as much spectrum as they wish to win at round prices in the earlier rounds in an attempt to avoid pushing up prices on those lots that they want to win. This incentive is normally addressed through activity rules that make the right of a bidder to continue bidding in future rounds contingent on the bidder's activity in any given round.

If all lots in the proposed auction were identical, the simplest activity rule relates to the number of lots a bidder bids for in a round. This is the case proposed for the 800 MHz and 900 MHz bands where a straightforward 1:1 activity rule is proposed, and the eligibility to bid in the following round is based on the number of lots bid in the current round.

With the proposed inclusion of the 1800 MHz band, this issue is complicated as the valuation of an 1800 MHz lot is likely to be lower than a sub-1GHz lot. In such situations, undesired strategic behaviour can occur as bids could be placed on relatively cheap lot categories in order to dampen demand for the more expensive lots. However, as noted above such behaviour is risky, as any bid at any time is potentially binding.

In order to set an adjustment that takes account of value differences across spectrum bands, it is necessary to attribute weights to the lots of spectrum in the different bands that represent their relative value. These relative values can then be represented by a number of eligibility points attributed to lots in each band. The activity rules of the auction would then work in the same way as in the simple case of the 1:1 valuation, with the exception that demand in a round, and the corresponding eligibility to bid in the following round, is measured not by the numbers of lots, but by the number of eligibility points.

This issue has been considered by DotEcon in section 6 of its report (ComReg Document 10/105a). It is worth noting that the eligibility weights do not have to be set at the exact relative value between the 1800 MHz band and sub-1GHz spectrum, as this relative value will only become known as a result of the auction. Instead, a reasonable approximation of the relative values is sufficient to set the eligibility weights, and the results of the 1800 MHz fees benchmarking study (as discussed in Section 3.8 above) suggest that the value of a lot of spectrum in the 1800 MHz band is approximately half of that of a lot of sub-1GHz spectrum.

Given the above, and in line with DotEcon's recommendation, ComReg believes that the simplest way to implement these eligibility weights across the spectrum bands is to assign twice as many eligibility points to the sub-1GHz lots as compared to lots in the 1800 MHz band, as depicted in Table 3 below.

Table 3: The Proposed eligibility points for a 2 x 5 MHz lot

Band	Number of eligibility points for a 2x5MHz lot
800 MHz band	2
900 MHz band	2
1800 MHz band	1

3.9.2 ComReg's proposal

ComReg is of the preliminary view that substitutability of 1800 MHz spectrum and sub-1GHz spectrum should be allowed in the auction. ComReg therefore proposes to use a 2:1 eligibility point weighting (as set out above) for the bids on lots in the sub-1GHz band compared to bids on lots in the 1800 MHz band.

Q.11. Do you agree with ComReg's proposal to set a 2:1 ratio in relation to the eligibility points awarded to lots in the sub-1GHz and 1800 MHz bands, whereby twice as many eligibility points would be awarded for sub-1GHz lots as for lots in the 1800 MHz band? Please provide reasons for your view.

3.10 Proposed licence conditions for liberalised 1800 MHz rights of use

The purpose of this section is to consider the nature and extent of licence conditions which should apply to 1800 MHz rights of use granted in the proposed joint award of spectrum.

Section 4.6 of Consultation 10/71 set out ComReg proposals for licence conditions in respect of the sub-1GHz spectrum, having had due regard to the responses received to Consultation 09/99. The detail of these responses is still being considered and will be addressed in ComReg's forthcoming response to consultation and draft decision documents.

The primary focus of this section is whether it would be appropriate to set licence conditions for the 1800 MHz band different to those presently proposed for the sub-1GHz spectrum.

3.10.1 Licence Duration

As discussed in Section 3.4 above, ComReg proposes the use of two temporal lots in the joint award with the duration of these lots being the same for all bands. As currently proposed, the duration of a liberalised 1800 MHz licence would be circa 2½ years (early 2013 to 12th July 2015) for the first temporal lot and 15 years (13th July 2015 to 12th July 2030) for the second temporal lot.

3.10.2 Technology and Service Neutrality

In a similar manner to the proposal for the 800 MHz and 900 MHz bands, and as detailed in Consultation 10/71, ComReg proposes to apply a technology- and service-neutral approach to licences in the 1800 MHz band. As such, any terrestrial system deployed in this band would be required to comply with the obligations set out in the EC Decision[35] on the 900 MHz and 1800 MHz bands.

The EC Decision currently permits the use of UMTS and GSM terrestrial systems and ComReg is aware that amendments to the EC Decision to allow the use of LTE and WiMAX technologies are currently under discussion. In addition, ComReg notes that Article 5 of the GSM Amending Directive allows Member States to permit the use of other terrestrial systems not listed in the Annex of the EC Decision provided these other terrestrial systems can co-exist with the permitted terrestrial systems explicitly listed.[36]

[35] See EC Decision (2009/766/EC) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009D0766:EN:NOT

[36] The EC Decision currently explicitly permits the use of the GSM and UMTS technologies. However, work is ongoing at a European level to amend the Annex to this EC Decision and the outcome of this work may result in explicit listing of LTE and WiMAX as terrestrial systems that can be deployed in the 1800 MHz band.

3.10.3 Interference Mitigation

In accordance with ComReg's statutory objective to ensure the effective management and efficient use of radio spectrum, and noting provisions under the Wireless Telegraphy Act, 1926 relating to harmful interference, ComReg is proposing to include licence conditions setting out the interference mitigation conditions relating to:

- Other users in the same frequency band;
- Other users in adjacent bands; and
- Other users in a different geographical area.[37]

3.10.3.1 Other users in the same frequency band

The interference mitigation obligations in respect of other users in the same band are set out in the respective EC Decisions on the 800 MHz band, the 900 MHz and the 1800 MHz bands. In the absence of bilateral or multilateral agreements between neighbouring users, ComReg proposes to apply the technical parameters as set out in these EC Decisions as they represent essential components of the conditions necessary to ensure coexistence between neighbouring users in the same frequency band.

3.10.3.2 Other users in an adjacent frequency band

The EC Decisions on the 800 MHz, 900 MHz and 1800 MHz also oblige Member States to give appropriate protection to systems in adjacent frequency bands. At a European level, CEPT has carried out numerous technical compatibility studies in relation to the consideration of interference issue and the findings of the studies have been taken into consideration by the EC in setting the technical parameters in the respective EC Decisions.

Accordingly, it is ComReg's intention to apply the terms of the relevant EC Decision to 1800 MHz spectrum issued via the proposed joint auction.

ComReg notes that one respondent to Consultation 10/71 raised the issue of potential interference from the 800 MHz band into the broadcasting bands and ComReg will set out its position on this issue in due course, noting that studies in relation to same are being conducted in a number of jurisdictions.

3.10.3.3 Other users in a different geographical area, e.g. cross-border interference

Radio waves do not observe international boundaries and so it is often necessary for neighbouring spectrum management authorities to co-ordinate their use of the radio spectrum in order to minimise cross-border interference. ComReg and the UK Regulator, Ofcom, have signed a number of Memorandum of Understanding ("MoU") in relation to the mitigation of cross border interference and licensees would be obliged to comply with such MoU.

In relation to the spectrum bands in the proposed joint award, it is ComReg's proposal that all new licences issued would oblige the licensee to comply with such MoUs. In this regard, ComReg and Ofcom have recently agreed a draft MOU in relation to the 900 MHz and 1800 MHz bands (see Annex 1).

[37] While ComReg aims to set conditions that militate against the possibility of interference, interference issues may nevertheless arise from time to time. It is ComReg's intention to consider these issues on a case-by-case basis having regard to all relevant information at the time.

3.10.4 Coverage and Roll-out

The coverage and roll-out obligations for the sub-1GHz spectrum were discussed in Consultation 10/71 and in summary this consultation proposed:

- A 70% population coverage obligation to be met within 3 years for an existing operator and within 7 years for a new market entrant; and
- Other frequency bands could count towards the 70% coverage obligation, provided that a minimum of half of the 70% population coverage level (i.e. 35% population coverage) was provided via the sub-1GHz spectrum.

In considering the coverage and roll-out obligation that should apply to the 1800 MHz band, ComReg commissioned DotEcon to analyse the international experience of coverage obligations for mobile frequencies. Section 8 of DotEcon's report (ComReg Document 10/105a) sets out its recommended coverage obligations for 1800 MHz spectrum. In carrying out this analysis DotEcon studied three different scenarios:

i. A bidder wins 1800 MHz and sub-1GHz spectrum rights of use;
ii. An existing mobile network operator with a 2.1GHz network only wins 1800 MHz rights of use; and
iii. A new entrant to the mobile market only wins 1800 MHz rights of use.

In relation to the first scenario, it is likely that any bidder who wins sub-1GHz spectrum would have the option of using that spectrum to meet its coverage obligation and therefore there is no requirement to consider a separate 1800 MHz coverage obligation for this scenario.

In the second scenario if a licensee was to win only 1800 MHz spectrum but already had an existing 2.1 GHz licence, the coverage of its 2.1 GHz network would count towards the 70% coverage obligation for the new liberalised licence. In addition, and as per the proposal in Consultation 10/71, a minimum of half of the 70% population coverage level (i.e. 35% population coverage) attached to the new licence would have to be provided via the 1800 MHz spectrum band within 3 years. As highlighted in DotEcon's report (ComReg Document 10/105a), the requirement to meet 35% population coverage within 3 years is less onerous than the coverage obligation that applies to the 2.1GHz licences in Ireland and should, therefore, be achievable. ComReg is therefore of the view that it is not necessary to consider a separate 1800 MHz coverage obligation for this scenario.

In the third scenario, and in the context of ComReg's proposal in Consultation 10/71, a new entrant to the mobile market would be required to meet a 70% coverage obligation within 7 years of the start date of its 1800 MHz rights of use. In considering this scenario, DotEcon compared this proposed obligation with those currently in place in the 2.1GHz band. DotEcon notes that both the proposed coverage level (i.e. 70% population) and the roll-out time (i.e. 7 years) would be less onerous than those set in the 2.1GHz and should, therefore, be achievable. ComReg is therefore of the view that it is appropriate for a new entrant with only 1800 MHz spectrum to also meet the same coverage obligation as that proposed in Consultation 10/71, namely a coverage level of 70% of the population within a 7 year roll-out period.

In light of the above discussion and assuming that the sub-1GHz coverage and roll-out obligation as proposed in Consultation 10/71 remains, ComReg is of the view that there is no

need to set a separate coverage obligation for 1800 MHz spectrum, as the coverage obligations proposed in Consultation 10/71 for sub-1GHz spectrum should apply to all spectrum bands in the joint award, including the case where an operator wins only 1800 MHz spectrum.

In terms of measuring the coverage obligation, ComReg is aware that various technologies can be deployed in sub-1GHz and 1800 MHz bands. Based upon the measurement practices for technologies in the existing mobile licences, and the relevant standards for new technologies, Annex 3 of this consultation sets out ComReg's proposed measurement metrics for all spectrum bands in the joint award, namely the 800 MHz, 900 MHz and 1800 MHz bands.

ComReg notes that a number of other administrations are now taking steps to present independent information to consumers on mobile coverage levels. ComReg is considering separately such measures and is aware that such information can be presented in a number of ways.[38]

In Consultation 09/99, ComReg proposed the application of a performance bonds in relation to coverage obligations. While this issue was not explicitly raised in Consultation 10/71, ComReg intends to finalise its view on this issue in due course having regard to the responses received.

Q. 12. Do you agree with ComReg's proposal regarding coverage and roll-out obligations? Please provide reasons for your view.

3.10.5 Quality of Service & Miscellaneous licence conditions

In Consultation 10/71, ComReg proposed Quality of Service ("QoS") and miscellaneous licence conditions for the sub-1GHz spectrum. The miscellaneous licence conditions included those relating to international roaming, non-ionising radiation and access to the emergency services. ComReg's proposals were focused at a network or operator level and were not specific to a particular frequency band. Given this, the inclusion of the 1800 MHz band in the joint award should not therefore affect the QoS and miscellaneous licence conditions as proposed in Consultation 10/71. It is ComReg's intention to finalise its view on this issue in due course having regard to the responses received.

Additionally, and as discussed above, while the issue of performance bonds in relation to any QoS measure was not explicitly raised in Consultation 10/71, it was discussed and proposed in Consultation 09/99. Responses to this consultation have been received and it is ComReg's intentions to finalise its view on the issue of performance bonds in relation to any QoS measures in due course having regard to the responses received.

[38] For example, in Ireland the siteviewer website presents information on the number of GSM (900 MHz and 1800 MHz) and 3G (2100 MHz) sites in Ireland. See www.siteviewer.ie

In the UK, Ofcom, has published information on the 3G coverage of the mobile operators and has carried out research into the mobile not-spots areas. See http://licensing.ofcom.org.uk/radiocommunication-licences/mobile-wireless-broadband/cellular/3g/maps/ and http://stakeholders.ofcom.org.uk/binaries/research/telecoms-research/not-spots/not-spots.pdf

In France, ARCEP, provide information on the GSM and 3G mobile phone coverage. See www.arcep.fr for more information.

3.11 Summary of ComReg's proposals

The following sets out a summary list of ComReg's proposals for the joint award of the 800 MHz, 900 MHz and 1800 MHz spectrum bands.[39]

1. Award the three spectrum bands using a combinatorial clock auction (as proposed in Consultation 10/71), using a FDD arrangement with a 2 x 5 MHz block size.
2. Include a spectrum cap for the duration of the competition as follows:
    - an overall spectrum cap of 2 x 50 MHz; and
    - a sub-1GHz spectrum cap of 2 x 20 MHz (as proposed in Consultation 10/71).
3. Given that the cap set out at (2) above applies to this competition only, the existing spectrum assignments of 2.1GHz spectrum would not count towards the spectrum cap for this competition.[40]
4. Issue licences based on two temporal lots for all three spectrum bands:
    - Early 2013 – 12th July 2015; and
    - 13th July 2015 - 12th July 2030.
5. Arising from (4) above, there is a timing difference of approximately 6½ months between the expiry of Vodafone and O2's respective GSM 1800 MHz licences and the proposed commencement dates of licences for the second temporal lot. While ComReg does not entirely rule out the issue of interim rights of use, given the scope for considerable changes in spectrum assignments for these operators in the period leading up to December 2014, ComReg does not propose any specific regulatory measures in relation to this matter at this time.
6. In the first time slice, adopt a "full assignment round" approach whereby every lot in the 800 MHz, 900 MHz and 1800 MHz bands would be included in the assignment round of the proposed auction. This would therefore include lots currently occupied by the existing licensees in the 900 MHz and 1800 MHz bands irrespective of whether they chose the early liberalisation option or not. ComReg's previous proposal, as set out in Consultation 09/99, to consider relocating Meteor's existing GSM 900 MHz licence by 200 kHz would no longer be required in light of the "full assignment round" approach.
7. With regard to the 900 MHz and 1800 MHz GSM licensees whose existing GSM licences run into the first timeslot of the proposed award.[41], ComReg proposes that:
    a. A compensation scheme would be considered for operators who incur relocation costs in particular circumstances only. Compensation would be made if a 900 MHz or 1800 MHz licensee incurs relocation costs as a result of the proposed "full assignment round" and these costs would not have been otherwise incurred as a result of the joint award. Such costs would be objectively justified, proportionate and independently verified.
    b. GSM licensees would be allowed the option of early liberalisation of their existing GSM licences to liberalised licences.

[39] This summary is provided for convenience and should be read and considered in the context of this entire document and the proposals previously set out in Consultation 10/71.

[40] However in other circumstances where existing spectrum holdings were much larger in relation to the amount of spectrum being awarded, ComReg may come to a different view on whether they should be considered to count towards a competition spectrum cap.

[41] In the case of 900 MHz band, this would only apply to Meteor. In the case of 1800 MHz band, this would apply to the three existing 1800 MHz licence holders, namely Vodafone, O2 and Meteor

c. If a licensee were to opt for early liberalisation and is awarded a liberalised licence, this licensee would be entitled to a rebate for the residual period of its GSM licence. The rebate would be based on a relevant portion the original access fee paid for the licence, updated to current price levels using CPI data.

8. On the basis of DotEcon's relativity analysis, ComReg proposes to set a minimum price for 1800 MHz spectrum at 50% of the proposed minimum price for sub-1GHz spectrum, split 50/50 between an upfront reserve price, and annual SUFs.
9. To allow substitutability between the spectrum bands in the auction, ComReg proposes to set a 2:1 ratio in relation to the eligibility points awarded to lots in the sub-1GHz spectrum and lots in the 1800 MHz band, such that twice as many eligibility points would be awarded for sub-1GHz lots as for lots in the 1800 MHz band.
10. To set the following licence conditions in line with the relevant EC Decisions[42]:
    - In line with the proposed two temporal lots, the duration of a liberalised licence in the 1800 MHz bands would be circa 2½ years (early 2013 to 12th July 2015) for the first temporal lot and 15 years (13th July 2015 to 12th July 2030) for the second temporal lot. This duration is consistent with the proposed licence duration for the 800 MHz and 900 MHz bands as proposed in Consultation 10/71.
    - To issue technology- and service-neutral licences. This is consistent with the proposal for the 800 MHz and 900 MHz bands as proposed in Consultation 10/71.
    - In line with ComReg's statutory objectives to ensure the efficient management and effective use of radio spectrum, ComReg proposes to set interference mitigation conditions for all licences issued in the joint award.
    - The same coverage and roll-out obligations, as discussed in this document and in Consultation 10/71, should apply to all licences issued in the proposed joint award of the three spectrum bands.
    - The Quality of Service and Miscellaneous licence conditions as discussed in Consultation 10/71 should also apply to all licences issued in the joint award of the three spectrum bands.

[42] EC Decision (2009/766/EC) relates to the 900 MHz and 1800 MHz band. EC Decision (10/267/EU) relates to the 800 MHz band.

4 Transitional Arrangements

4.1 Introduction

As discussed earlier in this paper, ComReg is proposing to hold a joint award process for the assignment of rights of use in the 800 MHz, 900 MHz and 1800 MHz bands in mid-2011, where the commencement date for new liberalised-use licences in these bands is expected to be early 2013 (following ASO). In this context, ComReg expects that the results of the joint award would be known by mid-2011 and, at that stage, the amount of spectrum awarded to each bidder and the location of each bidder within these bands would also be known.

Given the projected timescales associated with the above proposed award process and the fact that there are existing GSM licensees in the 1800 MHz band, this chapter considers transitional issues that may be associated with the release of the 1800 MHz band, including:

- transitional issues from the time of the proposed joint award in mid-2011 until expected date of licence commencement in early 2013;
- transitional issues between the two proposed time slices for the 1800 MHz band; and
- ComReg's proposal to facilitate the build-out of networks by winners of liberalised rights of use for 1800 MHz, in advance of the proposed date of licence commencement in early 2013.

To assist its consideration of some of these matters, as discussed in Chapter 3, ComReg commissioned expert technical advice from Red-M and Vilicom to detail the process steps and estimated timeframes that could be associated with various transitional scenarios in the 1800 MHz band. Red-M/Vilicom's report has informed ComReg's consideration of the issues, and is published in conjunction with this Consultation.[43]

As similar matters were discussed in the context of ComReg's proposed 800 MHz and 900 MHz joint award process (in Consultation 10/71 and the corresponding Red-M/Vilicom Report 10/71c), the following chapter will assume familiarity with these matters and, for the sake of brevity and where appropriate, rely upon the discussion there.

In addition, ComReg notes and welcomes the responses it received on transitional issues in relation to its 800 MHz and 900 MHz proposal (as set out in Consultation 10/71). ComReg will address these matters in its forthcoming response to consultation and draft decision documents. Nevertheless, to the extent that such views have a direct bearing on consideration of transitional issues in the 1800 MHz band, then such views have been taken into account and have informed the following discussion.

4.2 Potential transitional issues in the 1800 MHz band: from proposed joint award in mid-2011 until 800 MHz availability

This section considers the likely time required by existing GSM 1800 MHz licensees to "relocate" within the band. Relocate, in this context, refers to an operator moving to a different part of the 1800 MHz band because they have fully availed of the proposed early liberalisation option and obtained rights to liberalised 1800 MHz spectrum commencing from early 2013. The relevant time available for such a move would be the same as in the 800

[43] Red-M/Vilicom Report, Document 10/105b.

MHz and 900 MHz context, that is, approximately 20 months from the date of the proposed spectrum award in mid-2011 until commencement of any new liberalised-use licences obtained in early 2013.

It is noted that similar issues were discussed in the context of the 900 MHz band in Consultation 10/71 and ComReg's proposed position, as informed by Red-M/Vilicom's study, was commented upon by several respondents to Consultation 10/71. The weight of responses would, on balance, appear to support ComReg's proposed approach to "relocation" activities. One respondent noted that a flexible approach to such issues would be necessary as it would be *"impractical, and likely insufficient, to seek to set out in advance the precise steps that would have to be undertaken by licensees in each of the wide range of outcomes that may be realised from a joint award process for the 800 MHz and 900 MHz spectrum bands".*

ComReg notes that one respondent did not agree with some of the assumptions underlying Red-M/Vilicom's analysis of "Scenario 2" and conclusions from their study, and a few respondents put forward alternative licensing approaches to the 800 MHz and 900 MHz band, noting that these could also involve different approaches to transitional issues. ComReg welcomes these views and other issues raised (e.g. cross-border issues) and proposes to address these matters in its forthcoming response to consultation and draft decision documents.

In light of the above, and bearing in mind the general comments made by ComReg in relation to the nature of Red-M/Vilicom's study in the 900 MHz band in Consultation 10/71 (i.e. regarding basic assumptions made in the context of a theoretical planning model and the focus on "worst case" situations etc), which would equally apply in the present context, ComReg notes that the current study by Red-M/Vilicom concludes that band reassignment activity for all 3 existing GSM 1800 MHz licensees could be completed in approximately 5 months.

Given the expectation that all GSM 1800 MHz licensees would have approximately 20 months to transition to new liberalised spectrum assignments, it is ComReg's view that the timeframes associated with this joint award between mid 2011 and early 2013 would be sufficient for the operators to address necessary transitional arrangements in relation to "relocation" within the 1800 MHz band.

Notwithstanding this, and in similar fashion to ComReg's proposed position in the 900 MHz band, ComReg is aware that in transitioning to any new liberalised-use 1800 MHz licences:

i. it may be necessary to vary the terms of the existing licences, where the holders did not avail of the early liberalisation option, to facilitate such transition in advance of the commencement date of the newly liberalised licences; and
ii. such transitional arrangements are dependent on the outcome of the auction, and, therefore, ComReg would consider requested variations to existing GSM 1800 MHz licences on a case-by-case basis.

Q.13. Do you agree with ComReg's proposed approach in relation to transitional issues that may arise in the 1800 MHz band in the period leading up to 1800 MHz availability? Please provide reasons for your view.

4.3 Potential transitional issues in the 800 MHz, 900 MHz and 1800 MHz bands: between proposed "time slice 1" and "time slice 2"

Given ComReg's proposal for two time slices in Section 3.4 of this document, ComReg notes that transitional issues for successful bidders in the 1800 MHz band may arise between the proposed two time slices.

In light of the possibility of such transition issues to arise, ComReg asked DotEcon to consider what reasonable and proportionate auction mechanisms could be implemented so as to reduce the probability and extent of necessary *relocation* activities of winners of rights of use between the proposed two time slices (that is, ensure continuous spectrum across time slices).[44] It is important to note that DotEcon's discussion relates to such transitional issues arising in the 800 MHz, 900 MHz *and* 1800 MHz bands (see ComReg Document 10/105a). The issue is considered in detail by DotEcon in Section 4.3 of its report and, as it is not proposed to repeat the analysis here. Readers are advised to carefully consider the relevant DotEcon text.

4.3.1 Retuning activities between time slices

Before discussing these potential mechanisms, it is important to note that DotEcon's analysis considers the potential implications with respect to relocation activities only.

Retuning activities (i.e where a bidder bids for and wins different amounts of spectrum in the different time slices) were not considered as such activities are inevitable. It is also important to bear in mind that winners of spectrum who require such retuning activities have, in effect, created this situation for themselves as a result of their bidding strategies. In this context, it would therefore not appear appropriate for other winners of liberalised spectrum to be adversely affected by these choices. Accordingly, and for the avoidance of doubt, ComReg's view is that it would not delay overall availability of rights of use for the 800 MHz, 900 MHz and 1800 MHz bands, in the second time slice of the auction, to make allowance for such *retuning* activities.

4.3.2 Ensuring continuous spectrum assignments across time slices – same quantum of spectrum

In its report, DotEcon identify and consider a mechanism that seeks to guarantee the same frequencies for each time period, by only making available assignment options on this basis. This would, however, only be applicable for a bidder winning the same amount of spectrum in the two time slices.

It is recognised that such a constraint, by definition, reduces the number of locations within a band for which bidders can express a preference. Whilst a bidder might have specific reasons (for instance, strategic reasons) as to why it might wish to have different frequency locations between time slices for the same quantum of spectrum, ComReg at this stage considers that imposing such a constraint would be reasonable and proportionate as doing so should benefit the individual bidder (by removing the possibility of relocation activities between time

[44] It is noted that DotEcon refer to "retune" in its text. For the avoidance of doubt and in the interests of consistency with previous consultation papers, "retuning" is defined in this consultation paper to mean activities required by an operator to adjust its network to deal with different quantum of spectrum in a band (e.g. from 7.2MHz to 5 MHz) whereas "relocating" is defined to mean activities required by an operator to move the same quantity of a spectrum assignment to a different part of the band (which can either be a partial relocation or complete/full relocation). It is additionally noted that Red-M/Vilicom use the terms retuning and relocation interchangeably in the context of a move of frequency assignments within the 1800 MHz band.

slices). In addition, such an approach would benefit other winners of rights of use in the band in the second time slice by removing the potential delay to availability of spectrum rights in the second time slice that could otherwise occur.

Accordingly, and in light of the analysis and recommendation of DotEcon, ComReg proposes to only present assignment options for continuous spectrum assignments across time slices for bidders winning the same amount of spectrum in the two time slices.

Q.14. Do you agree with ComReg's proposal for ensuring continuous spectrum assignments across time slices for the 800 MHz, 900 MHz and 1800 MHz bands where a bidder wins the same amount of spectrum in the two time slices? Please provide reasons for your view.

4.3.3 Transitional issues – different quantum of spectrum between time slices

DotEcon also considered the scenario where a bidder wins different amounts of spectrum rights in the two proposed time slices.

In this regard, a potential mechanism was identified that could be implemented whereby the number of assignment options presented to bidders winning different numbers of blocks in a band in the two proposed time slices could be limited to only those options involving a partial relocation. It is recognised that restricting assignment options in this way would also affect the assignment options for bidders with the same spectrum in the time slices. See the example provided by DotEcon in section 4.3 of its report (see ComReg Document 10/105a).

Accordingly, DotEcon consider that this additional constraint on assignment options would only be worth considering if:

i. The cost to an operator of relocating its frequencies within a band is not constant (that is, there are additional cost savings through a partial, as opposed to a full, relocation); and
ii. These perceived additional benefits outweigh the cost of reducing assignment options for other bidders (i.e. bidders with the same number of blocks in the two proposed time slices).

In this regard, DotEcon note:

i. It is not presently aware of evidence that preferences for partial relocation over full relocation are strong;
ii. Where such preferences are moderate, then bidders would, even without the constraint, still be able to express their preference for partial relocation assignment options; and
iii. The imposition of this additional constraint may considerably reduce assignment options for other bidders where there are a larger number of winners in the band or where there are more lots to be assigned (such as in the 1800 MHz band).

In relation to the likely cost of relocation activities in the 1800 MHz band, ComReg notes that the most recent Red-M/Vilicom report (ComReg Document 10/105b) suggests that there is unlikely to be any significant cost difference between a partial and full relocation in the 1800 MHz band.[45]

[45] For instance, a full relocation of 2 × 15 MHz was estimated to take 4 – 5 months to complete and involve a maximum cost of €240,000 (for 1 relocation) and €255,000 (for 2 relocations in quick succession).

On the other hand, Red-M/Vilicom's study of relocation activities in the 900 MHz band suggests that there may be some preference for a partial rather than a full relocation.[46] It is important to bear in mind, however, the following points from Red-M/Vilicom 900 MHz estimates:

i. Although the same approach has been used, the cost estimates for Scenario 3 are lower than for Scenario 1, because the former project is a 'retuning' project, and there is no requirement to deal with issues specific to 'relocation' such as replacement of some band selective repeaters; and

ii. As Scenario 3 would only ever apply to the Meteor network, the network size assumed can reflect the (smaller) Meteor network rather than the 'typical Irish network' used to produce the cost estimates for Scenario 1.

ComReg's proposal

At this stage and on the basis of available information, ComReg considers that:

- There does not appear to be any evidence to suggest that 1800 MHz bidders which won different numbers of blocks in a band in the two proposed time slices would have a strong preference for a partial rather than full relocation in the 1800 MHz band. In addition, ComReg notes the potential for increased costs to other bidders in terms of reduced choices in this band, due to the higher number of lots that would be assigned; and
- The available information regarding cost advantages for partial as compared to full relocation is not particularly conclusive for the 900 MHz band. In addition, the available information would not suggest that any such cost advantages would outweigh the cost of reducing assignment options for other bidders in this band, particularly where the former bidders would, even without implementation of the constraint, still be able to express their preference for partial relocation assignment options.

Accordingly, ComReg does not propose to limit assignment options to only those involving a partial relocation for the 1800 MHz band; and is not presently minded to implement same for the 800 MHz and 900 MHz bands, but is nevertheless seeking stakeholder views on its assessment.

Q.15. Do you agree with ComReg's proposal that it is not appropriate that the assignment options presented to bidders are only limited to those options involving a partial relocation? Please provide reasons for your view.

More generally, and in light of the above proposal with regards to ensuring continuous spectrum assignments across time slices, ComReg's proposed position is that it would not delay availability of 1800 MHz spectrum blocks in the second time slice to make allowance for any transition arrangements to be completed. That is, affected parties would be required to fully address such issues during the first time period.

[46] In particular, Scenario 1 (involving an incumbent obtaining 2 × 10 MHz and being required to conduct a full relocation) was estimated to take 5 months to complete. The study concludes that the engineering costs for a 'typically' sized Irish network would be of the order of €500,000 (having stated some clear assumptions around the amount of labour required, its costs and relevant equipment costs). In contrast, Scenario 3 (involving Meteor retaining 2 × 7.2 MHz GSM 900 MHz but being required to shift its existing assignment by 200 kHz (i.e. a partial relocation)) was estimated to take 4 months to complete and with a maximum estimated cost of €300 000.

In addition, it is recognised that, even if transitional issues were to arise notwithstanding the above proposed mechanisms, affected parties would have, assuming a joint award in mid-2011, approximately 4 years (until July 2015) with which to prepare for, and complete, the necessary transitional arrangements in time for the commencement of the proposed second time slice.

Furthermore, and on a similar basis to ComReg's proposed approach in the 800 MHz and 900 MHz joint award, to facilitate an industry-led approach, ComReg proposes that, as a pre-condition of entry to the proposed joint award, all prospective participants would be required to:

- Enter into a Memorandum of Understanding (MoU) under which they would agree to use best efforts to co-operate with other licensees and ComReg in addressing any transitional issues arising[47]; and
- In the event of a demonstrated failure to come to a voluntary arrangement with other affected parties, to agree to ComReg's determination on such matters.

In addition, ComReg would consider requested variations to liberalised licences as necessary to address such transitional issues on a case-by-case basis.

Q. 16: Do you agree with ComReg's proposed approach in relation to transitional issues that may arise in the 1800 MHz band (between time slices)? Please provide reasons for your view.

4.4 Preparatory licences for future 1800 MHz liberalised licensees

4.4.1 Proposal for Preparatory Licence in the 800 MHz and 900 MHz bands (Consultation 10/71)

In Consultation 10/71, ComReg set out its proposal to issue "preparatory licences" to all winners of liberalised 800 MHz and 900 MHz spectrum rights of use that would enable recipients to prepare for service commencement in early 2013 by allowing them to install networks and associated equipment (but not permit any wireless telegraphy transmissions) from shortly after conclusion of the licence award process so as to allow for earliest service provision following liberalised licence commencement. In addition, during this period ComReg stated that it would consider, and grant wherever possible, "test licences" to facilitate the testing of these networks and equipment.

ComReg notes and welcomes responses received to this proposal. In summary, there was substantial support for this proposal and reasons put forward in this regard included that:

i. It would be sensible and appropriate given the amount of preparatory network deployment work and associated testing that will need to take place in advance of commencement of services in early 2013;
ii. It would be essential to ensure the earliest possible provision of advanced mobile broadband services to the benefit of end users; and

[47] It is ComReg's intention to set out and invite views on the terms of the proposed MoU closer to the date of the proposed auction (such as in a draft Information Memorandum) so as to ensure that participants are aware of their potential obligations and duties. In relation to the view expressed in relation to including broadcast licensees in the MoU process, ComReg notes that the proposed MoU would take into account the likely effect of use of the 800 MHz band on broadcast services in adjacent bands.

iii. It would ensure that no time is wasted between the assignment process and the commencement of service and should mean that there will be no material impact caused by delaying the availability of the spectrum to a common commencement date.

On the other hand, two respondents did not support ComReg's proposal insofar as it would be unnecessary and/or inappropriate in the context of alternative licensing proposals put forward by them. For the avoidance of doubt, ComReg will address both the criticisms of its proposed 800 MHz and 900 MHz proposals and alternative options put forward by all respondents in its forthcoming response to consultation and draft decision documents. That said, ComReg notes that one of these respondents welcomed ComReg's proposal to try to minimise the effects of co-ordinating the timing of release of the 800 MHz and 900 MHz bands.[48]

4.4.2 Proposal for Preparatory Licence in the 1800 MHz band

Having had regard to respondents' views on ComReg's proposed issue of preparatory licences for the 800 MHz and 900 MHz bands, and in light of ComReg's continued belief regarding the overall benefits of same, ComReg therefore also proposes to issue preparatory licences (on similar terms) for winners of liberalised 1800 MHz spectrum rights of use.

Specifically ComReg proposes that all winners of liberalised rights of use in the joint award would be issued a "preparatory licence" under the Wireless Telegraphy Act, 192649 that would enable recipients to install networks and associated equipment (but would not allow any wireless telegraphy transmissions) in the respective frequency band won (i.e. 800 MHz, 900 MHz and/or 1800 MHz bands). This "preparatory licence" would commence from shortly after the conclusion of the licence award process and operate until the commencement date of new liberalised-use licences. During this period ComReg will consider and grant, wherever possible, 'test licences' to facilitate the testing of these networks and equipment.[50]

Q. 17: Do you agree with ComReg's proposal to issue 'preparatory licences' to winners of liberalised spectrum rights of use in the 1800 MHz band? Please provide reasons for your view.

[48] In relation to the view expressed that *"extensive testing would be required to ensure that mitigation techniques to protect broadcasting services are performing as expected"*, ComReg notes that any "test and trial" licences issued in the 800 MHz in the lead up to licence commencement in early 2013 would take into account the likely effect of use of the 800 MHz band on broadcast services in adjacent bands.

[49] By way of background: section 3(1) of the Wireless Telegraphy Act, 1926 makes it an offence for any person to possess any apparatus for wireless telegraphy (as defined) in the State without a licence granted under the same Act; and Section 5 (1) of the Wireless Telegraphy Act 1926, allows for a licence to be issued ' to keep and have possession of apparatus for wireless telegraphy' subject to 'such conditions and restrictions' as 'shall be prescribed in regard thereto by regulations' which would be made under Section 6 of same Act. Hence a licence could be issued which would allow for the lawful possession of apparatus for wireless telegraphy but which would include restrictions on use until the commencement date of new liberalised-use licences.

[50] See Test and Trial Ireland, www.testandtrial.ie .

5 Submitting Comments

The consultation period will run until 5pm on 21 January 2011, during which time ComReg welcomes written comments on any of the issues raised in this paper. The timeframe provided reflects the limited and focused nature of this particular consultation. All input and comments are welcome.

It would assist ComReg's analysis of submitted material if they are referenced to the relevant question numbers or sections from this document.

ComReg would also be grateful if respondents would clearly set out the reasoning and include available supporting information for any views expressed.

In order to promote further openness and transparency of this consultation process, ComReg will publish all respondents' submissions to this consultation, subject to the provisions of ComReg's *Guidelines on the Treatment of Confidential Information.*[51]

We would request that electronic submissions be submitted in an unprotected format to facilitate their publication in a compilation document.

ComReg appreciates that many of the issues raised in this paper may require respondents to provide confidential information if their comments are to be meaningful. As it is ComReg's policy to make all responses available on its website and for inspection generally, respondents to this consultation are requested to clearly identify confidential material and to place confidential material in a separate annex to their response.

In anticipation of any correspondence on matters relating to this document, or this consultation process generally, ComReg hereby gives notice that it will publish all material correspondence received in this regard. Such information will be treated in accordance with ComReg's *Guidelines on the Treatment of Confidential Information.*

5.1 Next Steps

Following receipt and consideration of comments received to this consultation, it is ComReg's intention to publish a response to consultation and draft decision on the joint award. ComReg must also come to a decision on its proposed interim licence proposal, the implementation of which would require preparation of a Statutory Instrument for presentation to the Minister for Communications Energy and Natural Resources for approval, prior to licence expiry.

ComReg will take into account, amongst other things, responses received to this consultation, Consultation 10/71, and ComReg's previous consultations (Consultation 09/99, Consultation 09/14 and Consultation 08/57 to the extent that previous views put forward by stakeholders remain relevant to ComReg's joint award proposals), other relevant inputs received to-date, and any other relevant material such as any further national developments on the release of the Digital Dividend in Ireland.

[51] ComReg 05/24 Response to Consultation - Guidelines on the Treatment of Confidential Information - March 2005

In the interim, ComReg intends to further engage with Ofcom with a view to establishing a MOU on frequency co-ordination in the 1800 MHz band between the two jurisdictions.

Annex 1 - Draft MoU for 900 MHz and 1800 MHz spectrum bands

DRAFT MEMORANDUM OF UNDERSTANDING ON FREQUENCY CO-ORDINATION BETWEEN THE REPUBLIC OF IRELAND AND THE UNITED KINGDOM IN THE FREQUENCY BANDS 880 – 915 MHz PAIRED WITH 925 to 960 MHz AND 1710-1785 MHz PAIRED WITH 1805 – 1880 MHz

1. INTRODUCTION

1.1. This Memorandum of Understanding (MoU) describes the procedures for the co-ordination of civil radio services between the Republic of Ireland (RoI) and the United Kingdom (UK) in the frequency bands 880 – 915 MHz paired with 925 to 960 MHz and 1710-1785 MHz paired with 1805 – 1880 MHz.

1.2. In Ireland and the UK the frequency bands 880 – 915 MHz, 925 MHz to 960 MHz, 1710-1785 MHz and 1805 – 1880 MHz are currently allocated to GSM. It is expected that they will in due course be liberalised in line with the Commission Decision (as amended from time to time) on the liberalisation of frequencies in the 900 MHz and 1800 MHz bands to allow them to be used for different mobile telephony technologies [1].

1.3. Ofcom is the Administration of the United Kingdom responsible for all relations with the RoI concerning this MoU.

1.4. The Commission for Communications Regulation (ComReg) is the Administration of the RoI responsible for all relations with the UK concerning this MoU.

1.5. Accordingly, the Administrations of the UK and the RoI have agreed the co-ordination procedures in this MoU.

1.6. This MoU applies in the territories of The Republic of Ireland and the United Kingdom.

1.7. The co-ordination procedure is based on the principle of equitable access to the spectrum resource.

1.8. Coordination of IMT/UMTS (FDD) services is based on the protection requirements for non preferential frequency blocks given in Par 2.2 of annex 2 (08)02 [52]

2. COMMITMENT OF THE ADMINISTRATIONS

The Administrations of the ROI and the UK are committed to ensuring that the radio-communication stations operating in the frequency band covered by this MoU, respect the limits for establishment of base stations without co-ordination given at paragraph 3, unless the stations are specifically exempt from the co-ordination procedure in accordance with paragraph 4.

[52] ECC Recommendation (08)02 Frequency Planning and Frequency Co-ordination for the GSM 900 (Including E-GSM) /UMTS 900, GSM 1800/UMTS 1800 Land Mobile Systems

3. CRITERIA FOR CO-ORDINATION

3.1. Stations using the GSM technology will be coordinated according to [53, 54 , 55]

3.2. Stations using technologies from the IMT family will be coordinated according to par 3.3 and 3.4 in line with paragraph 2.2 of ECC recommendation (08)02.

3.3. Stations using IMT/UMTS (FDD) technologies may be used without coordination with a neighbouring country if the mean field strength of each carrier produced by the base station does not exceed a value of:

a. In the frequency band 925-960 MHz: 59 dBµV/m/5MHz at a height of 3m above ground at the border line between two countries and 31 dBµV/m/5MHz at a height of 3 m above ground at a distance of 6 km inside the neighbouring country.

Or

b. In the frequency band 1805-1880 MHz:65 dBµV/m/5MHz at a height of 3m above ground at the border line between two countries and 37 dBµV/m/5MHz at a height of 3 m above ground at a distance of 6 km inside the neighbouring country.

3.4. Radiocommunication stations for which the predicted field strength exceeds the values given in par 3.3 must be co-ordinated in accordance with paragraph 7, except where stations are listed in paragraph 6 or an arrangement exists between operators as described in paragraph 4.

3.5. To establish the predicted field strength produced by a station, the methodology set out at paragraph 5 shall be employed.

3.6. In the case of non-continuous transmission, the interference power shall be the power emitted, during the active part of the signal, in the stated bandwidth.

4. ARRANGEMENTS BETWEEN OPERATORS

4.1. To facilitate reasonable and timely development of their systems, licensees are encouraged to develop Bilateral and Multilateral Arrangements.

4.2. Licensees holding rights, in each of the neighbouring countries, to use the frequencies of operation of a Radiocommunication station may mutually agree

[53] Memorandum of understanding on frequency co-ordination between Ireland and the United Kingdom in the frequency bands 880-890 MHz and 925-925 MHz designated for EGSM. In force 1 December 2005.

[54] Memorandum of understanding on frequency co-ordination between Ireland and the United Kingdom in the frequency bands 890-915 MHz and 935-960 MHz designated for the global system for mobile communication (GSM) in force 1 January 2001

[55] Memorandum of understanding concluded between the administrations of the United Kingdom and Ireland on co-ordination in the 1710-1785 and 1805-1880 MHz frequency bands in force 1 September 1999

conditions in which that station can exceed the predicted field strengths set out at paragraph 3.3.

4.3. Where licensees have reached such a mutual agreement, co-ordination of the corresponding station in accordance with paragraph 7 is not required, subject to the terms of the agreement between the licensees and subject to the agreement being lawful. It is the responsibility of the licensees to ensure that the agreement is lawful . It is also the responsibility of the licensees to ensure that an appropriate agreement is reached with all licensees in the neighbour country authorised to use frequencies at which the predicted field strength may exceed the thresholds set out at paragraph3.3.

4.4. In order to facilitate operator co-ordination, each Administration will provide names and point of contact information for the relevant licensees, subject to the agreement of the licensees.

5. PREDICTION OF PROPAGATION

The field prediction method shall be according to the latest version of Recommendation ITU-R P. 1546 [56:]

- 10% of the time
- 50% of locations
- Height of the receiver antenna 3m

Taking account of:

- Terrain profile for the base station in all main directions
- Type of terrain (e.g. land, sea, mixed path)
- Effective radiated field strength
- Antenna tilt and azimuth

Including model components:

- Mixed land/sea paths
- Receiving/mobile antenna height
- Terrain clearance angle

And standard value: DeltaN = 40 (N0m-N1000m)

[56] Recommendation ITU-R P.1546, Method for point-to-area predictions for terrestrial services in the Frequency range 30 MHz to 3,000 MHz

6. CO-ORDINATED STATIONS

The stations listed below have been agreed by both Administrations to be coordinated. Any subsequent change in the parameters given in the table shall void any acceptance of co-ordination for the corresponding station or stations.

	Name	Individual Channel bandwidth	Modulation	Centre Frequency	Lat	Long	East	North	Ground H AMSL (m)	H AGL (m)	EIRP dBm	Antenna Manufacturer reference	Pol	3dB BW Degs	Az Degs E of N.

7. CO-ORDINATION PROCEDURE

7.1. Exchanges of information for co-ordination/notification purposes shall be in the format set out in the HCM agreement Annex 2A (revised at Vilnius 2005). [57]

7.2. In the event of interference between authorised users of the frequency bands 925 MHz to 960 MHz, and 1805 – 1880 MHz MHz in the ROI and the UK, the affected users shall exchange information between themselves with a view to resolving the interference by mutual agreement. A report of the interference and the details of the information exchanged shall be sent to both Administrations. The Administrations of the ROI and the UK agree to facilitate the exchange of information between authorised users of the band.

7.3. Co-ordination request should be sent by the licensee through the administration responsible for its authorisation.

8. REVIEW OF MoU

8.1. The co-ordination threshold and prediction methods defined in this MoU may be reviewed in the light of new technologies, experience of operation of networks in both countries and future prediction developments.

8.2. This MoU explicitly covers co-ordination of GSM and IMT(FDD) services between the UK and the RoI, and may need to be reviewed if other technologies are to be considered.

9. TERMINATION OF THE MEMORANDUM OF UNDERSTANDING

Either Administration may withdraw from this Memorandum of Understanding subject to 6 months notice.

[57] Agreement between the Administrations of … on the Co-ordination of frequencies between 29.7 MHz and 39.5 GHz for fixed service and land mobile service (HCM Agreement) Vilnius, 2005
http://hcm.bundesnetzagentur.de/http/englisch/verwaltung/index_europakarte.htm

10. DATE OF ENTRY INTO FORCE

This Memorandum of Understanding shall enter into force on Day Month Year.

Signed on Day Month Year .

For the administration of The Republic of Ireland

For the UNITED KINGDOM administration

Annex 2 – International Update

1. EC and CEPT activities on adding new systems to the Annex of the EC Decision

In 2009, the EC tasked CEPT ECC to study the co-existence of WiMax and LTE with the systems listed in the Annex of the EC Decision (currently GSM and UMTS).

ECC PT1, the CEPT project team responsible for IMT systems, produced three draft reports (CEPT draft reports 40, 41 and 42) which considered the coexistence of WiMax and LTE systems with GSM and UMTS in the 900 MHz band, the 1800 MHz band and with systems operating in adjacent bands. CEPT held a public consultation on the draft reports which closed on 5 September 2010 and the reports were subsequently approved at the 27th meeting of the CEPT ECC in November.

The reports were presented for consideration at the EC's Radio Spectrum Committee in December 2010, with a view to adding WiMax and LTE to the Annex of the EC Decision.

2. Updates, trials and commercial launches

Australia[58]

In March 2010, Australian operator, Telstra, began LTE trials in Victoria. In June, Telstra announced that in one rural hill-top to hill-top test, using a 20 MHz wide channel in the 2.6 GHz band, it measured downlink speeds averaging 88 Mbps over a distance of 75 km. In July, Telstra also announced that it was commencing an LTE trial in the 1800 MHz band.

Also in July, the operator Optus announced that it had trialled LTE in 10 MHz of spectrum in the 2 GHz band in metropolitan Sydney. Peak download speeds were reported to exceed 50 Mbps. Optus is also planning to test LTE in the 1800 MHz band.

Research analysts, Ovum, considers that significant impact from LTE deployment will not occur in Australia until 2014 although, by the end of that year, LTE should constitute 10% of mobile connections in Australia and circa 168 Million worldwide.

Denmark[59]

Denmark's National IT and Telecom Agency (NITA) announced the dates for an auction of spectrum in the 900 MHz and 1800 MHz frequency bands. The auctions were to be held online on 20 and 25 October 2010 for two national licences of 2 x 5 MHz in the 900 MHz band and 2 x 10 MHz in the 1800 MHz band respectively.

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[58] *Sources:* www.gsacom.com; www.telstra.com; and http://about.ovum.com/podcasts/uploads/LTE.pdf

[59] *Source:* http://lteworld.org/news/new-spectrum-auction-900-and-1800-mhz-frequencies-denmark

Operators currently holding licences in the 900 MHz and 1800 MHz frequency bands were to be excluded from participation in the auctions.

NITA has since announced, however, that it has cancelled the two spectrum auctions for 2 x 10 MHz in the 1800 MHz spectrum and 2 x 5 MHz in the 900 MHz spectrum and awarded 3Denmark all frequencies. 3Denmark will pay the planned auction reserve prices of DKK 8m (circa €1M) for 2 x 5 MHz of 900 MHz spectrum and DKK 4m (circa €500K) for 2 x 10 MHz in the 1800 MHz band. Annual spectrum fees for 900 MHz licences are set at €15,000 per 2 x 1 MHz of 900 MHz spectrum and €7,500 per 2 x 1 MHz of 1800 MHz spectrum.

Finland[60]

In June 2010, Sonera (a subsidiary of TeliaSonera) began deploying Finland's first LTE network in the regional city of Turku in South-Western Finland (population circa 175 000). TeliaSonera has nationwide LTE licenses in Finland, Norway, Sweden and Denmark. In December 2009, it was the first operator to launch LTE commercially, offering services to customers in Sweden and Norway, although it has been reported that a shortage of LTE data cards has slowed take-up of the service. Sonera's LTE network uses two frequencies, 1800 MHz and 2.6 GHz. The terminals used during the first phase operate in the 2.6 GHz band only, however terminals capable of operating in both bands are expected to be available from spring 2011.

Finnish mobile operator, Elisa, has chosen Nokia Siemens Networks to supply LTE network equipment for the first phase of its network deployment, and said it would open the service to the public when more LTE devices are available. Elisa predicts that LTE devices for the 1800 MHz band will be available 6 to 12 months after LTE equipment for the 2.6 GHz band and anticipates LTE being ready for a mass rollout in the 1800 MHz band in 2012.

France[61]

Mobile operator, SFR, awarded a contract to Nokia Siemens Networks to upgrade and expand its 2G/3G networks and to conduct LTE trials. Another operator, Bouygues Telecom, is trialling LTE in 2 x 10 MHz of spectrum in the 1800 MHz band at a number of sites in Orléans in Northern France (population circa 116 000).
A HSPA trial in the 1800 MHz band will be conducted on Orange's network in France starting in November 2010, using Ericsson base stations and Qualcomm-based terminals. Orange already uses HSPA in the 900 MHz band to expand 3G coverage. Both base stations and devices will support 2G at 900 MHz and 1800 MHz and 3G/HSPA at 900 MHz, 1800 MHz and 2100 MHz.

[60] *Sources:* http://lteworld.org/news/sonera-rolls-out-4g-lte-network-finland; http://www.reuters.com/article/idUSLDE6511OB20100602; and http://www.totaltele.com/view.aspx?ID=459534&G=1&C=1&page=2

[61] *Sources:* http://www.orange.com/en_EN/press/press_releases/att00016597/PR_Orange_UMTS1800_trial_030810.pdf; www.lteportal.com

Germany[62]

In advance of its May 2010 spectrum auction, the Federal Network Agency (BNetzA) announced that within three months of releasing the results of same it would begin the process of assessing the competitive situation in the 800 MHz and 900 MHz bands with a view to possible refarming measures. BNetzA's initial consultation on the matter closed on 11 October. Nine respondents submitted written comments, including operators, industry representatives and the Federal Competition Office.

BNetzA's draft decision is expected in Q2 of 2011 with publication of the final review decision tentatively planned for Q3/Q4.

The 800 MHz and 2.6 GHz spectrum lots auctioned in the May competition were awarded on an "abstract" basis. That is, following the auction, the successful bidders had the option of agreeing amongst themselves on the specific frequencies to be awarded. As no agreement was reached between the successful bidders, it fell to BNetzA to assign these frequency blocks in an open and transparent procedure. In September 2010, BNetzA assigned the specific frequencies to licensees through a lottery process.

The mobile operator Deutsche Telekom has indicated that it will deploy 1800 MHz LTE hotspots in high-usage areas, although it has not yet committed to a target date for hotspot deployment or indicated when it expects 1800 MHz user terminals to become available.

Hong Kong[63]

Hong Kong operator, CSL Limited, announced in July 2010 that it engaged in a six-month LTE trial in Kowloon Bay and would be deploying the world first a dual-band 1800/2600 MHz commercial LTE network.

SmarTone-Vodafone, an operator that did not acquire any 2.6 GHz spectrum in a 2009 auction, plans to launch LTE commercially using its existing 900 MHz and 1800 MHz holdings in 2013.

Malta[64]

In February 2009, the Malta Communications Authority (MCA) published its consultation paper outlining its proposals for the award of spectrum in the 900 MHz and 1800 MHz bands, including proposed licence conditions. In July 2010, the MCA

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[62] *Sources:* http://www.bundesnetzagentur.de/cln_1932/SharedDocs/Pressemitteilungen/EN/2010/100830AllotmentFrequBlocks.html?nn=48242; http://www.bundesnetzagentur.de/cln_1911/DE/Sachgebiete/Telekommunikation/RegulierungTelekommunikation/Frequenzordnung/OeffentlicherMobilfunk/Frequenzverteilungsuntersuchung/FreqVertUntersuchung_node.html; Cullen International and https://communicationsdirectnews.com/do.php/140/42338?13932

[63] *Sources:* GSA; http://lteworld.org/news/csl-and-zte-demonstrate-dual-cell-hspalte-network; http://www.mobilebusinessbriefing.com/article/hong-kong-and-singapore-lead-lte-charge-in-asia-pacific; andwww.hkcsl.com

[64] *Source:* www.mca.org.mt

published its response outlining a process to assess demand for spectrum followed by a possible auction-based award mechanism.

On 27 October 2010, the MCA invited applications for future 900 MHz and 1800 MHz licences whereby applicants may apply for abstract lots of 2 x 5 MHz up to a maximum of 4 lots in the 900 MHz band and 8 lots across both bands. If there is excess demand, the MCA states that it will facilitate a negotiated outcome for future spectrum assignments. If no agreement can be reached then an auction mechanism will be used.

Netherlands[65]

The Dutch government has indicated that it will release the 800 MHz, 900 MHz and 1800 MHz spectrum bands in late 2011 / early 2012. The spectrum to be released will include all spectrum currently licensed in the 900 MHz and 1800 MHz bands as well as the 60 MHz of paired spectrum from the digital dividend (of which 2 x10 MHz band has been reserved for newcomers) which is expected to be available for use in 2013.

Poland[66]

In September 2010, Poland became the fourth country to commercially launch LTE and the first in the world to deploy the technology in the 1800 MHz band. The launch was made by a consortium of the country's three newest operators, two of which (CenterNet and Mobyland) are deploying LTE in 2 x 20 MHz of their 1800 MHz assignments which also support 2G voice services.

The first phase of the LTE deployment was achieved through a software upgrade of existing 2G networks covering the cities of Warsaw, Katowice and Lodz. Peak download speeds of 153 Mbps have been reported, although precise details of the tests such as cell loading and distance are not available.

Spain[67]

In June 2010, the Ministry of Industry, Tourism and Commerce consulted on the future of the 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz bands. The consultation, which closed on 15 July 2010, included the following proposals concerning the 1800 MHz band:

- The Ministry would consider applications to liberalise assignments in the 1800 MHz band on request, with requests would be considered in two stages during 2010 and 2014;
- Operators seeking liberalisation of their assignments must return 2 x 5 MHz to the administration where returned spectrum would be awarded by a call for

[65] *Source:* http://www.telecompaper.com/news/dutch-spectrum-auction-set-for-2012-with-room-for-newcomers

[66] *Source:* https://www.policytracker.com/headlines/worlds-first-lte-1800-network-launched-in-poland)

[67] *Source:* http://www.cullen-international.com

tender or an auction in 2011, from which incumbent operators would be excluded;
- Operators returning spectrum would receive a two-year licence extension for their remaining 1800 MHz assignments; and
- A spectrum cap would limit holdings in the 1800 MHz, 2100 MHz and 2.6 GHz bands to a maximum of 2 x 55 MHz of FDD spectrum.

The Telecommunications Market Commission (the independent regulator of the electronic communications sector) submitted comments on the Ministry's proposals noting that the cross-band cap should be 115 MHz including TDD-spectrum, instead of the proposed 55 MHz covering only FDD-spectrum.

Switzerland[68]

Existing GSM licences were extended in 2009 in order to harmonise their expiry dates. The decision to extend these licences also included measures which came into effect early in 2010 allowing the regulator to redistribute spectrum in the bands. The redistribution of spectrum was completed in March 2010 and each operator now has access to at least 2 x 5 MHz of spectrum in the 900 MHz band.

The current GSM and UMTS licences will expire in 2013 and 2016 respectively and the regulator is now planning a 2011 "big bang" auction of 550 MHz of spectrum in the 800 MHz, 900 MHz, 1.8 GHz, 2.1 GHz and 2.6 bands.

A consultation was published in June 2009 and in November 2009 the NRA published its report on the comments received. The report noted that the renewal of existing licences may lead to asymmetries in frequency holdings and inefficiencies in the market. The NRA favours a big bang auction of the spectrum due to the complementary nature of the different frequency bands available, the increased likelihood of a successful new entrant and the reduced administrative costs associated with a single competition**.**

United Kingdom[69]

Orange/T-Mobile merger

On 2 February 2010, following requests lodged by network operators Orange and T-Mobile, the UK Office of Fair Trading (OFT) submitted a request to the EC pursuant

[68] *Source:* http://www.bakom.admin.ch/dokumentation/medieninformationen/00471/index.html?lang=en&msg-id=26651

[69] *Sources:* http://www.oft.gov.uk/news-and-updates/press/2010/23-10 ; http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/208 ; http://www.v3.co.uk/v3/news/2258126/orange-mobile-offer-1800mhz ; http://www.catribunal.org.uk/237-6510/1154-3-3-10-Telefnica-O2-UK-Limited.html ; and http://stakeholders.ofcom.org.uk/consultations/spectrumlib/advice-to-government/)

to Article 9 of the EU Merger Regulation which held that the UK aspects of the merger[70] should be referred to the UK for review by the OFT.

The OFT later withdrew its request to the EC to review the UK aspects of the joint venture after the operators offered remedies fully addressing the OFT's competition concerns. In particular, the parties have:

- offered to release 1800 MHz spectrum, and
- reached an agreement with H3G which ensures H3G's ability to compete in the retail market will not be affected as a result of the transaction.

On March 1 the EC announced that it had cleared the Orange/T-Mobile merger. The EC's approval of the merger will result in the release of 2 x 15 MHz of 1800 MHz spectrum for reassignment.

Telefonica O2 appeal to have its GSM 900 MHz and 1800 MHz licence varied so as to use UMTS

On 26 May 2010, Telefonica O2 appealed to the Competition Appeal Tribunal ("the Tribunal") against the Office of Communications' (Ofcom) failure to grant its application for a variation of its licence so as to allow it to use, with effect from 9 May 2010, UMTS technology in the 900 MHz and 1800 MHz frequency bands.

On 7 October, the Tribunal concluded by a majority that the GSM Amending Directive and the EC Decision are concerned with the technical harmonisation measures that Member States should put in place to ensure that, by 9 May 2010, the 900 MHz and 1800 MHz frequency bands could be authorised for use with UMTS technology. The Directives comprising the European common regulatory framework, in particular the Authorisation Directive, make clear that a two stage approach is to be adopted: firstly, the necessary harmonisation across the EU under the GSM Amendment Directive must take place by 9 May 2010; and secondly, the implementation of the necessary authorisations and any necessary licence amendments under the Authorisation Directive.

The Tribunal did not accept that O2 already had the right to use the 900 MHz and 1800 MHz frequency bands for UMTS and that O2's only right was to use the bands for GSM. The Tribunal noted that *"much clearer words would have been used* [in the EC Decision], *had it been intended that licence restrictions on the use of UMTS technology should be lifted without any prior evaluation of the competition implications or any compliance with the procedures laid down by the Authorisation Directive (and in particular with the mandatory provisions of Article 14)".*

In addition, the Tribunal noted that a working document published by the EU's Radio Spectrum Committee (the "Working Document") provided as follows in relation to the term "making available" (which relevantly appears in the GSM Amending Directive):

[70] Case COMP/M.5650

"*The concept of "**making a band available**" requires some clarifications. The Commission services' view can be summarised as follows. Making available a spectrum band means preparing all the necessary steps so that the authorisation process can start if a potential user so requests, and therefore letting potential users know that they will have the possibility to access a frequency band under specific conditions. In practice this involves adopting or amending national legal acts that would regulate the use of the radio frequencies in a more detailed way. This requires several steps that must be completed within the deadline set by the Decision:*

- *freeing the band if individual rights of use were granted for another application than the one foreseen …*
- *in cases where spectrum use is subject to general authorisation, adopting the national legal text which submits a category of applications to general authorisation and includes the relevant technical conditions of use,*
- *in cases where spectrum use is subject to individual rights for electronic communication services, launching the public consultation on a possible limitation of the number of rights of use (under Article 7(1)(b) of the Authorisation Directive)*".

On 27 October, Ofcom published its advice to the UK Government to liberalise licences in the 900 MHz and 1800 MHz bands without imposing conditions beyond essential technical requirements. In this regard, it is noted that in its February 2009 consultation paper, Ofcom considered that incumbent GSM 900 MHz licensees (being Vodafone and O2 which, between them, occupy the entire 900 MHz band) should release a block of 2 x 5 MHz for reassignment to another party. Ofcom now considers that liberalising spectrum in the hands of the existing licensees is unlikely to result in a competitive distortion and that requiring the release of spectrum is no longer proportionate in light of the expected relocation costs.

The change in Ofcom's position reflects the recent merger of the 1800 MHz operators Orange and T-Mobile. According to Ofcom, the new merged operator (Everything Everywhere) and to a lesser extent H3G through its network sharing arrangement with same, are now in a stronger position in terms of network capability for providing UMTS services. They have the largest amount of 2100 MHz spectrum and access to the largest number of base station sites.

Annex 3: ComReg's proposed measurements metrics for the 1800 MHz, 900 MHz and 800 MHz bands.

Proposed 1800 MHz coverage metrics

For GSM Technology:

- For measurement purposes – an average pilot signal field strength of 54 dBµV/m/200 kHz measured outdoors at a height of 1.5m
- For propagation prediction systems – a pilot signal field strength of 54 dBµV/m/200 kHz over 95% of the area during 95 % of the time.

For UMTS (3G[71]) Technology:

- For measurement purposes – an average pilot signal field strength of 57dBµV/m/5MHz measured outdoors at a height of 1.5m, or an Ec/Io>= 8dB[72].
- For propagation prediction systems – a pilot signal field strength of 57dBµV/m/5MHz over 95% of the area during 95 % of the time.

For LTE[73] Technology:

- For measurement purposes – an average pilot signal field strength of 62dBµV/m/MHz[74] measured outdoors at a height of 1.5m, or an Eb/No>= -8dB[75].
- For propagation prediction systems – a pilot signal field strength of 62dBµV/m/MHz over 95% of the area during 95 % of the time.

Proposed 900 MHz coverage metrics

For GSM Technology:

- For measurement purposes – an average pilot signal field strength of 46dBµV/m/200 kHz measured outdoors at a height of 1.5m
- For propagation prediction systems – a pilot signal field strength of 46dBµV/m/200 kHz over 95% of the area during 95 % of the time.

For 3G Technology:

- For measurement purposes – an average pilot signal field strength of 50dBµV/m/5MHz measured outdoors at a height of 1.5m
- For propagation prediction systems – a pilot signal field strength of 50dBµV/m/5MHz over 95% of the area during 95 % of the time.

[71] 3GPP Release '99 to Release 7 inclusive

[72] See 3GPP TR25.942 et al.

[73] 3GPP Release 8

[74] Correct for the relevant LTE carrier bandwidth under study.

[75] Or -10dB with MIMO

Proposed 800 MHz coverage metrics

For LTE[76] Technology:

- For measurement purposes – an average pilot signal field strength of 54 dBµV/m/MHz measured outdoors at a height of 1.5m, or an Eb/No>= -8dB[77].
- For propagation prediction systems – a pilot signal field strength of 54dBµV/m/MHz over 95% of the area during 95 % of the time.

Proposed for other technologies

In general, ComReg is aware that over the lifetime of the licence other technologies (e.g. WiMAX, etc.) may also be deployed in the 800 MHz, 900 MHz and 1800 MHz band. It is ComReg's intention to set a measurement standard for these technologies as and when deployed.

For Other Technologies:

- For measurement purposes – an average pilot signal field strength of "X[78]" measured outdoors at a height of 1.5m, or a Carrier to Interference (C/I) ratio of -YdB[79]
- For propagation prediction systems – a pilot signal field strength of "X" over 95% of the area during 95 % of the time.

[76] 3GPP Release 8

[77] Or -10dB with MIMO

[78] Corrected for the bandwidth used but based on a harmonised European or International standard it would be confirmed following consultation with stakeholders.

[79] This would be the C/I ratio giving a quasi error free channel, following a standards based approach.

Annex 4: List of Consultation Questions

Q.1. Do you agree with ComReg's proposal to use a Frequency Division Duplex (FDD) arrangement with a 2 x 5 MHz Block size for the 1800 MHz band? Please provide reasons for your view.

Q.2. Do you agree with ComReg's proposal to set an overall cap of 2 x 50 MHz for the joint award including the 2 x 20 MHz sub-1GHz spectrum cap that was proposed in Consultation 10/71? Please provide reasons for your view.

Q.3. Do you agree with ComReg's proposal to use two temporal lots as proposed for the sub-1GHz spectrum, namely early 2013 – 12th July 2015 and 13th July 2015 – 12th July 2030, in the joint award including the 1800 MHz band? Please give reasons for your view.

Q.4. Do you agree with ComReg's approach in relation to the period between the expiry of Vodafone and O2's respective GSM 1800 MHz licences and the proposed commencement date of licences for the second "time slice" in the 1800 MHz band? Please provide reasons for your view.

Q.5. Do you agree with ComReg's view that there are important benefits to be obtained from designing the auction to ensure that new licences will comprise of contiguous spectrum assignments in the first time slice? Please provide reasons for your view.

Q.6. Do you agree with ComReg's proposal to introduce a "full assignment round" into the first time slice of the 900 MHz and 1800 MHz bands? Please give reasons for your view.

Q.7. Do you consider it appropriate that ComReg would provide compensation to a GSM licensee, in either the 900 MHz or 1800 MHz band, for required relocation costs that otherwise would have been avoided? Please give reasons for your view.

Q.8. Do you agree with ComReg's proposal to adopt an early liberalisation approach for both the 900 MHz and 1800 MHz bands? Please provide reasons for your view.

Q.9. Do you agree with ComReg's "rebate" proposal for 900 MHz and 1800 MHz GSM licences? Please provide reasons for your view.

Q. 10. Do you agree with the proposed methodology for setting licence fees for 1800 MHz spectrum? Do you agree with the proposed minimum price for 1800 MHz spectrum to be set at 50% of the proposed minimum price for sub-1GHz spectrum, split 50/50 between an upfront reserve price, and annual spectrum usage fees? Please provide reasons for your view.

Q.11. Do you agree with ComReg's proposal to set a 2:1 ratio in relation to the eligibility points awarded to lots in the sub-1GHz and 1800 MHz bands, whereby twice as many eligibility points would be awarded for sub-1GHz lots as for lots in the 1800 MHz band? Please provide reasons for your view.

Q. 12. Do you agree with ComReg's proposal regarding coverage and roll-out obligations? Please provide reasons for your view.

Q.13. Do you agree with ComReg's proposed approach in relation to transitional issues that may arise in the 1800 MHz band in the period leading up to 1800 MHz availability? Please provide reasons for your view.

Q.14. Do you agree with ComReg's proposal for ensuring continuous spectrum assignments across time slices for the 800 MHz, 900 MHz and 1800 MHz bands where a bidder wins the same amount of spectrum in the two time slices? Please provide reasons for your view.

Q.15. Do you agree with ComReg's proposal that it is not appropriate that the assignment options presented to bidders are only limited to those options involving a partial relocation? Please provide reasons for your view.

Q. 16: Do you agree with ComReg's proposed approach in relation to transitional issues that may arise in the 1800 MHz band (between time slices)? Please provide reasons for your view.

Q. 17: Do you agree with ComReg's proposal to issue 'preparatory licences' to winners of liberalised spectrum rights of use in the 1800 MHz band? Please provide reasons for your view.