Commission for
Communications Regulation

Response to Consultation and Further Consultation

Liberalising the Future Use of the 900 MHz and 1800 MHz Spectrum Bands

Response to Consultation 09/14 and Further Consultation

Document No:	**09/99**
Date:	**21 December 2009**

Contents

1 Foreword

The Commission for Communications Regulation (ComReg), as the national authority for spectrum management, and for the authorisation and licensing of the provision of electronic communications networks and services, now faces into two critical decisions regarding the use of 900 MHz and 1800 MHz spectrum bands. Currently these bands are designated for use by GSM services, and spectrum in these bands has been assigned under licence to three Mobile Network Operators (MNOs). Under European law, we must now determine how to liberalise the use of this spectrum, so that services other than GSM may be offered in these bands. We must also decide what to do with the spectrum currently assigned to these MNOs once the licences expire, which in two cases will occur soon, in May 2011. Other companies have expressed interest in using spectrum that becomes available to launch their own services.

Ireland has been well served in the last 16 years by GSM services that provide wide geographical coverage and almost ubiquitous availability of telephony and simple data services (so called '2nd Generation,' or "2G", services). As many as 4 million mobile subscriptions are GSM-based today. Advanced '3rd Generation' (or "3G") services, offering mobile broadband, were introduced more recently, in 2006, using spectrum in the 2.1 GHz range. These have also proved successful in the market, accounting for over a quarter of all broadband subscriptions today. By liberalising use of the 900 MHz and 1800 MHz bands, we can make it possible for mobile broadband services to be offered in future within these 'lower' bands, alongside or instead of GSM services, according to the needs of the market. This is especially significant in view of the superior propagation characteristics of the 900 MHz frequency band, ensuring wider area coverage and better building penetration, and thus offering the prospect of mobile broadband services being more widely available nationally. Liberalisation will also facilitate the introduction of more advanced '4G' services, as these become commercially viable and once they are technically approved for use in these bands. Wider availability of broadband, and greater scope for innovation, are two important benefits of liberalisation, with the potential to contribute significantly to the development of the 'Smart Economy'.

In approaching these decisions, ComReg has been conscious at all times of the many considerations to be taken into account, its statutory powers, duties and functions, and the objectives it is required by law to seek to achieve in exercising its functions. In the current context, of course, it is particularly conscious of its statutory function of managing the radio frequency spectrum in accordance with ministerial policy directions, and of the objectives it must seek to achieve in exercising its functions in this process. To ensure that we are fully informed, to abide by our consultation requirements and to ensure that interested parties have had an opportunity to contribute to, and comment on, the process as it has evolved, we have held two major public consultations over the last 16 months (ComReg documents 08/57 and 09/14); conducted a further set of bilateral discussions with respondents to our consultations this Summer (also published and available on www.comreg.ie); sought expert technical advice on the options available to us for assigning spectrum; and researched in detail the approaches being adopted by other EU authorities. Indeed, further responses

are invited at various junctures in this document, and ComReg will take these into account in its impending decisions.

This document presents ComReg's considered response to the matters raised in Consultation 09/14, and sets out our proposed overall approach to liberalisation of 900 MHz and 1800 MHz, and in detail our proposed approach to future spectrum assignment at 900 MHz. ComReg intends to move forward as rapidly as possible to enable the use of liberalised 900 MHz spectrum band in support of advanced mobile services and in the best interests of consumers.

Alex Chisholm
Commissioner

2 Executive Summary

In July 2008 ComReg published its first consultation on liberalising the use of the 900 MHz and 1800 MHz spectrum bands (Consultation 08/57). This was followed in March 2009 with a response to that initial consultation and further consultation (Consultation 09/14) to which nine respondents submitted comments. This document sets out ComReg's response to Consultation 09/14 and further consults on a number of specific matters including proposed licence conditions.

Update on recent developments in Europe

Since the publication of Consultation 09/14, there have been a number of significant relevant developments in Europe. In October 2009, the Directive (2009/114/EC) amending the existing GSM Directive, thereby removing the previous reservation of the 900 MHz band for GSM, was adopted at a European level. At the same time the European Commission (EC) published a harmonisation decision designating the 900 MHz and 1800 MHz bands for terrestrial electronic communications services, and there is progress to consider the inclusion of other technologies such as Long Term Evolution (LTE) and Worldwide Interoperability for Microwave Access (WiMax).

A number of EU Member States have also advanced their plans in relation to the implementation of the Amending Directive and the EC Decision and details on this progress is included as an annex to this document.

ComReg also notes recent changes to the European Common Regulatory Framework and considers that its proposals would be consistent with changes to the relevant Directives (noting that the precise nature of amendments to domestic legislation is yet to be decided).

Bilateral meetings with respondents

Given the significance of this matter and complexity of the issues raised, ComReg provided the opportunity for respondents to Consultation 08/57 and/or Consultation 09/14 to speak to, and clarify, their previous written submissions in a bilateral meeting with ComReg. For the most part, incumbent GSM licensees used this opportunity to restate their views that competitive solutions for the future release of 900 MHz spectrum would entail a risk of service disturbance to them and consequent risk of disruption to consumer services. However, all acknowledged the value in increasing the number of blocks made available in the first auction as this would reduce any 'artificial' spectrum scarcity and the difficulty in establishing any opportunity cost for 900 MHz spectrum in advance of an auction. Further, the existing GSM licensees accepted the need for a balance between upfront and ongoing spectrum usage fees and there was no opposition to H3GI or any other new player being assigned 2 × 5 MHz of 900 MHz spectrum provided each existing GSM licensees was assigned 2 × 10 MHz of same in the first instance. Arguments

were again put forward concerning the demand for and release of 1800 MHz which is discussed later.

Those seeking access to the band generally adopted alternative views. In particular H3GI stated that it was very serious about securing 2 × 10 MHz of spectrum at 900 MHz and that ComReg must ensure no market distortion in its solution for the band. Most others affirmed their focus on spectrum bands other than the GSM bands and saw little possibility of entering the mobile market through the build out of their own networks. UPC for its part stated that it had no interest in the 1800 MHz band as it does not believe it could effectively compete with incumbents holding 900 MHz spectrum.

Additional matters raised by respondents

In their responses a number of parties raised additional matters for ComReg's consideration, on which ComReg had set out its position. These include:

- early provision for Long Term Evolution (LTE) in the bands;
- contrary views to ComReg regarding the timing of the release of the 1800 MHz band;
- the potential to take account of any spectrum released as a result of the "digital dividend";
- the possible impact of any future legislation that may permit spectrum trading;
- assertions of existing GSM licensees concerning their harbouring expectations of licence-renewal;
- potential disruption to consumer services; and
- spectrum scarcity in relation to liberalised 900 MHz spectrum.

ComReg, while recognising the tremendous potential of LTE, believes that its deployment in the 900 MHz band is still some time away. Given the impending expiration of licences, ComReg must proceed with this licence competition at this time but will keenly monitor the progress of LTE as it moves toward commercial deployment and adoption in Europe at 900 MHz.

In relation to the 1800 MHz band, ComReg is not aware of any credible evidence to support the conclusion that LTE equipment (operator and/or consumer) will become available in this band in the near future. Currently in Ireland, 1800 MHz spectrum is largely used to complement spectrum use in the 900 MHz band, typically in urban areas to support high levels of traffic and capacity in a network. Notwithstanding the foregoing, and mindful of the pace of change in electronic communications networks and services, ComReg will further assess the basis for the release of 1800 MHz spectrum following the completion of the 900 MHz competition and, if appropriate, will hold a competition for access to 1800 MHz spectrum considerably sooner than 2013.

ComReg recently set out its current thinking on the Digital Dividend in Ireland in consultation document 09/15. ComReg will further develop its position with respect to the Digital Dividend and will consult further, having regard to

developments at a national and international level, particularly as regards the timing of any spectrum release, and the quantity of spectrum available.

In relation to spectrum trading, there are no legislative provisions which enable spectrum trading to occur in Ireland and the introduction of a spectrum trading regime in Ireland or otherwise is a matter for policy makers and the legislature.

Certain existing GSM licensees also provided further submissions on their respective expectation of a renewal of their current licenses, based on an interpretation of a statement made by ComReg's predecessor, the Office of the Director of Telecommunications Regulation, in an Information Memorandum in 2001 ("the Director's Statement"). ComReg has had careful regard to the submissions, as well as to the assertions of the GSM licensees concerning their harbouring expectations of licence-renewal. ComReg has also considered and assessed various options in the process to date, taking into account the expectations expressed by the licensees concerned, as well as their submissions generally. In this further response to consultation document, ComReg has stated its position that it is not required as a matter of law to deliver upon the GSM licensees' interpretation of the Director's Statement.

A number of respondents provided further submissions regarding the potential for ComReg's auction-based proposal to result in consumer disruption in the event that existing GSM licensees were not successful in obtaining sufficient spectrum with which to service their existing customer base. Having further considered the issue, ComReg is of the view that there are reasons to believe that the probability of incumbents not gaining sufficient spectrum, and thus the probability of consumer disruption, is more likely to be low. In addition, in light of the various "mitigation factors" that could reasonably be employed to reduce the extent of any consumer disruption, and the ability and incentive of winners of liberalised 900 MHz spectrum to secure those customers seeking to switch from unsuccessful existing GSM licensees, ComReg considers the extent of the small probability of consumer disruption is also likely to be limited in scope. ComReg also notes that any such consumer disruption would be temporary in nature, particularly when viewed in the context of decisions on the future licensing of the 900 MHz band that will substantially determine the nature and extent of consumer benefits in relation to mobile services over at least a 15 year period. While ComReg recognises that the low likelihood for consumer disruption could be eliminated by renewing existing GSM licences (or otherwise administratively assigning spectrum to these licensees), ComReg considers there to be serious disadvantages to long term consumer welfare attached with such an approach.

Several respondents also questioned the basis for ComReg's assessment of likely spectrum scarcity in relation to the 900 MHz band. In responding, ComReg details the reasons for its view that demand for liberalised 900 MHz spectrum would likely exceed supply, including the statements of existing mobile operators and potential entrants, the particularly valuable nature of 900 MHz spectrum and likely spectrum requirements in relation to future technologies.

Summary of Options and proposals for spectrum release for 900 MHz band.

Throughout its consultation process, ComReg has sought to determine how best to liberalise and make available spectrum in the 900 MHz band in accordance with developments which have now been formalised in the Amending Directive and the EC Decision, and in the context of its statutory functions and objectives.

In Consultation 08/57 ComReg tabled three options (A, B and C). Having considered the views of all respondents in this regard and in light of the fact that ComReg's thinking and analysis on spectrum award has developed considerably since it put forward its proposals in Consultation 08/57, ComReg has decided to give no further consideration to Options A, B and C.

In Consultation 09/14, ComReg put forward two new options for the future licensing of the 900 MHz band, building on the work undertaken in 08/57, and taking account of the feedback received in relation to 08/57. In addition, ComReg invited views on variations to these proposals or altogether new proposals that ComReg should consider in finalising the process, along with supporting arguments and detailed alternatives.

ComReg's consultations have identified a number of characteristics which must be addressed, these principally being:

- the expiry of existing GSM 900 MHz licences;
- asymmetries in mobile spectrum holdings between existing mobile operators. In particular, three mobile operators (Vodafone, O2, and Meteor) each make use of 900 MHz, 1800 MHz and 2100 MHz spectrum whereas the fourth operator, H3GI, uses 2100 MHz spectrum only;
- likely spectrum scarcity in relation to liberalised 900 MHz spectrum;
- asymmetry in relation to GSM 900 MHz licence expiry as two of these licences, held by Vodafone and O2, expire in 2011 and the third, held by Meteor, expires in 2015;
- liberalising the entire 900 MHz band as soon as possible to ensure the full benefits associated with liberalisation are realised and passed onto users, without creating distortions to competition; and
- how to allow existing and future licensees to effectively and efficiently determine their location in the band including by facilitating access to contiguous blocks.

In light of the above, and having due regard to the views expressed by respondents in relation to these matters, ComReg engaged expert advisors, DotEcon, to advise on the design of a competitive process that would deal with these issues using market mechanisms, wherever possible. The report produced by DotEcon, which has informed ComReg's consideration of appropriate processes, has been published in conjunction with this Response to Consultation and Further Consultation. In this report DotEcon has formulated

a proposal for an auction format, which is akin to ComReg's Option 1. This is set out in detail at Part B of the accompanying DotEcon Report. Notwithstanding, ComReg has also undertaken analysis of all relevant options, including an option based upon DotEcon's proposal, in the context of a Regulatory Impact Assessment (RIA) analytical framework and in light of its statutory functions and objectives which are set out at Sections 9 and 10 of this document.

Revised option for liberalising the 900 MHz band

In formulating its revised option for liberalising the 900 MHz band (see Figure 1, Section 7), DotEcon has been mindful of ComReg's publicly stated position on a number of issues:

1. Any existing 900 MHz GSM licence and any spectrum retained to address GSM legacy issues would not be liberalised, while all new licences in the 900 MHz band would be issued on a liberalised basis.
2. The restriction on the amount of spectrum in the 900 MHz band that could be held by any licensee to 2 × 10 MHz. For the avoidance of doubt, this cap would apply across all spectrum licences in the 900 MHz band, that is to existing, legacy (if any) and new liberalised licences.
3. The award of any future 900 MHz spectrum in a minimum block size of 2 × 5 MHz.
4. The holding of a competitive award process for assignment of 1800 MHz frequencies closer to 2013 would provide greater clarity to applicants on spectrum developments in other bands of interest for wideband data transmission, namely the 2.6 GHz band and Digital Dividend spectrum.

The preferred option set out by DotEcon, "Modified Option 1", would involve making as much as possible of the entire 900 MHz band available in a single auction. The key steps of this option would be as follows:

i) In 2010 the spectrum in the 900 MHz band would be made available, in blocks of 2 × 5 MHz, in a single licence competition. It is possible that the entire band can be liberalised, if as per point (v) below, Meteor was to avail of the opportunity for early liberalisation;

ii) No applicant would be permitted to obtain more than 2 × 10 MHz of spectrum in line with the proposed spectrum cap, in keeping with ComReg's earlier consultation on this matter. However and in order to ensure a robust process in the event that demand does not exceed supply ComReg is minded to relax the auction spectrum cap and accept bids up to 2 × 15 MHz;

iii) A two-stage process would be used for the assignment of specific frequencies. In the first stage (the so-called Main Stage), bidders would bid for a number of generic 2 × 5 MHz lots. Having won a certain number of these generic lots (maximum of two lots in accordance with the spectrum cap), the second stage (the Assignment Stage) would determine,

on the basis of bids submitted, the location of spectrum in the band to be assigned to winners;

iv) All lots would be divided into "temporal lots" as outlined in the table below, which shows the 7 pairs of available spectrum across two time periods, 2011-15 and 2015-30. In this approach at least 12 lots would be made available at auction as illustrated. The shaded entries indicate the 12 lots that would definitely be made available in 2010.

2011 – 2015	**2015 - 2030**
A1	A2
B1	B2
C1	C2
D1	D2
E1	E2
F1	F2
G1	G2

Table 1 Temporal Lots

This option deals effectively with different licence expiry dates and locks in frequency assignments in 2011 so that no administrative frequency realignment in 2015 is necessary.

v) A further extension of step (iv) is to allow the spectrum associated with Meteor's existing licence, currently covering part of blocks C1 and all of D1, to be made available on a liberalised basis in 2010 (i.e. before the scheduled licence expiry in 2015). In summary, to achieve this, a package bid would be augmented to include the possibility of releasing existing spectrum as well as buying lots. The spectrum cap would determine the validity of such a package bid, in that it would be necessary for Meteor to give up a sufficient amount of spectrum in order for bids for liberalised spectrum to be acceptable. In the event that any bid by Meteor involving the early release of spectrum is unsuccessful, then the spectrum would remain with Meteor on an un-liberalised basis for the remaining term of its licence. By matching any spectrum released by Meteor to spectrum acquired by Meteor, the auction would address Meteor's concerns, without altering the amount of spectrum available to other potential bidders in the auction.

vi) Prices for winners in each stage would be determined using a second price rule which would provide reasonable incentives for bidders to bid at or close to their true values for the packages of lots.

Draft Regulatory Impact Assessment and evaluation of options in light of ComReg's objectives

ComReg has analysed each relevant option for the future licensing of the 900 MHz band in the context of a RIA analytical framework and will, furthermore, consider all comments received in respect of same.

In carrying out the draft RIA, ComReg has assessed the options bearing in mind relevant criteria, including its statutory objectives and policy directions made by the Minister under section 13 of the 2002 Act. In addition, ComReg has separately considered each of these options with regard to particular statutory objectives, criteria and Policy Directions.

ComReg believes that there is no option available that will completely satisfy all stakeholders and be compatible with the statutory framework within which its decisions must be made. However, ComReg believes that, based on the analysis of the different options considered in the context of the RIA analytical framework and evaluated against ComReg's statutory objectives (and the Policy Directions), on balance, Modified Option 1 (as set out in the DotEcon report and summarised in Section 8.2) is the best available approach.

ComReg's Proposed Approach and Auction Format

Whilst bearing in mind the draft nature of the RIA and subject to the possibility of modification following this consultation, ComReg currently proposes to proceed with the establishment of a competitive award process based on Modified Option 1.

In this regard, DotEcon identified and examined four potential candidate auction formats; a standard simultaneous multiple-round ascending (SMRA) auction, a SMRA auction with augmented switching, a combinatorial clock auctions (CCA) and a sealed-bid combinatorial auction. In light of its analysis of the different formats, DotEcon is of the view that a combinatorial auction is the ideal auction format in present circumstances. Its main reason for this recommendation is that in the context of the present award, the use of a combinatorial format provides the particular advantages of a solution to the problem of aggregation and fragmentation risks that arise with the more traditional SMRA and its variants.

The combinatorial auction proposed involves a two stage process. The first stage would determine the number of generic 2 × 5 MHz lots won by each bidder and the price by allowing bidders to bid for a certain number of generic lots. Winners would be chosen to maximise the total value of winning bids, subject to not awarding more lots than the number of lots available and maintaining the spectrum cap. The price of spectrum would be set at the level of the second highest bid, reflecting the opportunity cost of the spectrum. Qualifying bids must be at or above a pre-set reserve price. If demand does not exceed supply then all bids in the first stage are won at the reserve price.

Given the outcome of the first stage, ComReg would be in a position to determine all the feasible frequency locations for winning bids on the basis that all winning multiple lots will be assigned contiguous spectrum. The second stage would then determine which exact spectrum is allocated to winners (that is, the location in the frequency band), by allowing winners in the first stage to make bids for the lots they have won, to be located at various specific frequencies. This is called the assignment stage.

To assist with understanding Modified Option 1 as put forward by DotEcon, ComReg would refer stakeholders to the draft auction rules set out by DotEcon. ComReg has carefully reviewed these draft rules in light of its statutory objectives and is satisfied that they would give effect to the proposed auction objectives and parameters in an objectively justified, proportionate, non-discriminatory and transparent manner. ComReg is presenting these draft rules to provide stakeholders with a view to providing as much visibility as possible as to how the proposed auction format would likely operate, so as to fully inform their understanding of the auction format and, in turn, their response to the consultation questions in relation to same.

Proposed Auction fees

A key consideration in auction implementation is determining whether a minimum price would be required and, if so, at what level it should be set (in this award process the minimum price is the sum of the reserve price plus the sum of the annual spectrum usage fees across the full term of the licence). DotEcon has recommended the adoption of a significant minimum price in present circumstances to avoid the potential concerns of the risk of collusive behaviour, given the potential for a small number of participants. Furthermore, they advise that where competition may be weak in an auction due to external factors (such as technological or standards uncertainty or the state of capital markets and/or capital availability), setting a low minimum price may not see the auction reveal the true, long-run economic value of spectrum access.

ComReg recognises the potential for a limited number of potential participants and/or limited excess demand for this particular auction and therefore sees merit in implementing appropriate measures aimed at minimising the ability and incentive for participants to engage in any potentially collusive behaviour. ComReg would also see such measures as being appropriate in light of its statutory objective of promoting competition. In light of these considerations, ComReg has determined that the following factors should inform the determination of the minimum price for this award:

- the minimum price should not give rise to or increase incentives for collusive behaviour;
- the minimum price should deliver a fair return to the State for the use of this finite natural resource and the price of spectrum should reflect its economic value to the user;
- the minimum price should not be set so high as to choke off demand;
- the minimum price should not be set so low that there is participation by frivolous bidders;
- the minimum price should not reflect any "social option value"; and
- the administrative costs of running the award process should be recovered from the minimum price set.

DotEcon has examined four possible approaches to setting a minimum price and has assessed the merits of these approaches in the context of an auction for liberalised 900 MHz spectrum in Ireland in Section 10.3 of its report. Having

carefully considered the four approaches, the relative advantages and disadvantages of each approach as determined by DotEcon and ComReg, the applicability of each approach to Ireland's circumstances and the context of this spectrum award process, ComReg proposes to adopt the benchmarking approach to determining the minimum price as the most appropriate methodology for this award process.

A summary of ComReg's proposals in relation to auction fees are as follows.

1. Set a minimum price of €30 million for each single 2 × 5 MHz block of liberalised 900 MHz spectrum made available in the auction;

2. Set a reserve price of €6.3 million for a 4 year licence (2011-2015) and a reserve price of €10.2 million for a 15-year licence (2015-2030). These reserve prices, applicable to each 2 × 5 MHz block will need to be deposited in full as part of the application process;

3. At least 50% of the excess of a bidder's winning price over the reserve price will need to be paid before any licence is issued, within the timeframe set by the auction rules;

4. 50% of the minimum price would be recovered via annual Spectrum Utilisation Fees (SUFs);

5. SUFs will be set at €1.8 million per block per annum (assuming a discount rate of 10.2%); and

6. SUFs and interest costs as a result of any deferred payments will be indexed against inflation.

Coexistence of future and legacy services

The presence of legacy GSM services in non-liberalised assignments in the 900 MHz band has implications for consumers, existing operators and winners of future assignments in the 900 MHz band. ComReg has put forward proposals in this document which provide for a competitive, auction-based mechanism by which Meteor could gain access to liberalised spectrum, if it chooses, in advance of the expiry of its existing GSM 900 MHz licence in 2015. Notwithstanding these proposals and irrespective of the outcome of an auction under Modified Option 1, a degree of frequency coordination and cooperation in adjustment of individual base station parameters is likely to be required among future licensees.

Until the outcome of the auction under Modified Option 1 is known it is not possible to identify the specific nature of coordination issues which are likely to arise but ComReg's preference is to allow licensees to negotiate and determine the most appropriate coordination with their neighbour/s and for ComReg to only intervene as a last resort so as to ensure compliance with the technical conditions of the EC Decision.

However, and given Meteor's existing GSM licence (and that the centre frequency of its uppermost GSM channel in Block D is only 200 kHz from the edge of Block E), the need for coordination and cooperation could arise between Block D and adjoining blocks. These issues could also impact upon the manner in which the proposed auction would be run and the ability of same to obtain spectrally and economically efficient outcomes. While ComReg remains 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 must also provide regulatory certainty to all operators in the event that it does not, and also take appropriate steps to ensure that the proposed auction delivers efficient outcomes across the entire 900 MHz band.

Accordingly, and depending on the outcome of these events, the proposed potential measure envisaged by ComReg would be to require that any GSM spectrum retained by Meteor following the proposed auction and until licence expiry in 2015 would be subject to the obligation that it could not be used within 200 kHz of the boundary of Block D without the neighbouring licensee's consent. In the context of Meteor retaining Blocks C and D for GSM use post-auction, the application of the proposed potential measure would involve shifting Meteor's assignment in Block C and D down by 200 kHz into Block C1.

In light of its statutory obligations under the Authorisation Regulations, ComReg invites interested parties to make representations on all aspects of the proposed potential measures as part of this consultation process.

Licence Conditions and Potential Commitments

ComReg has chosen the use of an auction as the preferred competitive award process for licences in the 900 MHz band, and its proposals in that regard do not involve voluntary commitments playing a part in the selection process. ComReg is instead seeking to establish a set of licence conditions that are based on objective, transparent, non-discriminatory and proportionate criteria, and has made the following proposals in this consultation.

ComReg proposes a Service and Technology Neutrality approach that is in line with the Amending Directive and EC Decision and does not propose to mandate the deployment of any particular technology or the provision of any particular service other than to require that any technology or service deployed in the band must demonstrate compatibility with existing services.

ComReg proposes to measure coverage by reference to the presence of a signal with a minimum field strength. This is in line with the current practices of the GSM and 3G licences. ComReg is conscious that services are now provided over multiple frequency bands and proposes to allow coverage in other frequency bands (such as the 1800 MHz and 2100 MHz bands) to count towards a 900 MHz coverage condition. In relation to the required minimum coverage level and roll-out timeframes, ComReg is seeking views on whether this obligation should be symmetric across all parties.

If it is appropriate to have symmetric levels, then ComReg would consider the following to be appropriate:

- a 30% geographic coverage obligation after 4 years, a 70% geographic coverage obligation after 7 years and a 90% geographic coverage obligation after 10 years.

If it is appropriate to have asymmetric levels, then ComReg would consider the following to be appropriate:

- a 90% geographic coverage obligation after 3 years for the existing GSM 900 MHz mobile network operators;
- a 90% geographic coverage obligation after 3 years for the existing non-900 MHz mobile network operators, provided that their existing coverage (e.g. in the 2100 MHz band) counts towards the 900 MHz coverage obligation; and
- a 30% geographic coverage obligation after 4 years, a 70% geographic coverage obligation after 7 years and a 90% geographic coverage obligation after 10 years for a new entrant to the Irish mobile market.

In meeting any of the above coverage obligations, ComReg is consulting on whether national roaming could count towards a 900 MHz obligation and if so to what extent.

ComReg has also proposed a quality of service licence condition in relation to the minimum quality level for the voice call and mobile broadband services as well as an obligation on minimum network availability. ComReg is seeking feedback on whether to continue the existing practice of including a billing obligation as a licence condition or whether it is more appropriate to address such issues under the General Authorisation framework. ComReg is also consulting on whether QoS conditions should be attached to a VoIP service, should a licensee provide this service.

To support the proposed quality of service and coverage obligations, ComReg has proposed a number of reporting obligations and the submission of a total performance guarantee of €3 million, of which €2 million is to be set aside against coverage and €1 million against QoS.

ComReg has also proposed licence conditions on Access to the Emergency Services, International Roaming Capability and Non-Ionising Radiation.

Concerning Mobile Virtual Network Operators, as no respondent stated that it would volunteer MVNO commitments, MVNO commitment are nor proposed as features in the forthcoming competition. ComReg will, however, continue to monitor the competition issue identified in Consultation 09/14 and will, where appropriate, address this issue with regulatory tools at its disposal under the European Regulatory Framework.

ComReg is now seeking the views of interested parties on the proposed licence conditions.

Submitting comments

The consultation period will run until 5pm on 12 February 2010 during which the Commission welcomes written comments on any of the issues raised in this paper. In keeping with our usual practice, responses will be published, subject to any necessary confidentiality.

Having analysed and considered the comments received, ComReg will review the subject matter and publish a report in Spring 2010 in response to this further consultation. This report will, *inter alia*, summarise the responses to the consultation, and set out ComReg's views on the matters raised and the way ahead. Based on our current expectations, we would also want to publish draft Auction Rules at this time. Given the relative proximity of the initial licence expiries at 900 MHz, ComReg proposes to move forward without delay.

3 Introduction

In July 2008 ComReg published Consultation Document 08/57[1] which contained proposals on liberalising the use of the 900 MHz and 1800 MHz spectrum bands ("Consultation 08/57"). Consultation 08/57 embraced a broad range of issues and nine responses were received[2], addressing the questions ComReg posed as well as raising a number of additional issues for ComReg to consider.

ComReg published its response and further consultation, document 09/14, in March 2009. This consultation focused on issues surrounding the appropriateness of Mobile Virtual Network Operator (MVNO) commitments in addition to setting out two further options on 900 MHz spectrum release, including the management of potential GSM legacy issues and conditions that might apply to any new licences issued in the band.

Ten responses to Consultation 09/14 were received and all non-confidential versions of these responses were published in ComReg Document 09/51s. Responses were received from (in alphabetical order):

- Digiweb Ltd;
- ESB;
- Hutchinson 3G Ireland Ltd;
- Ireland Offline;
- LM Ericsson Ltd;
- Meteor Mobile Communications Ltd;
- Qualcomm Europe Inc;
- Telefónica O2 Ireland Ltd;
- UPC Ltd; and
- Vodafone Ireland Ltd.

Some parties also chose to submit additional documents in support of their positions and the non-confidential versions of these documents, as agreed between ComReg and the respective party, are published in ComReg documents 09/51s[3] and 09/99s.

ComReg is grateful for the views and supporting material put forward to date and has taken all of this into account in forming its position on the wide range of issues involved in this complex matter.

The remainder of this document is structured as follows:

[1] ComReg Document 08/57 – Liberalising the use of the 900 MHz and 1800 MHz Spectrum bands – published 17 July 2008.

[2] ComReg Document 09/14s – Submissions to Consultation 08/57 – Liberalising the use of the 900 MHz and 1800 MHz Spectrum bands – published 12 March 2009.

[3] ComReg Document 09/51s – Consultation Submissions - Liberalising the use of the 900 MHz and 1800 MHz Spectrum Bands – published 18 June 2009.

- **Section 4** sets out recent legislative and related developments across Europe since the publication of Consultation 09/14, as well as the outcome of spectrum coordination meetings with Ofcom, the UK communications market regulator;

- **Section 5** summarises the outcome of recent bilateral meetings with consultation respondents;

- **Section 6** addresses additional matters raised by respondents covering such issues as LTE, the 1800 MHz band, the digital dividend and spectrum trading. This section also sets out ComReg's position on representations pertaining to the expectations by current licensees concerning licence renewal, consumer disruption, spectrum releases in other bands and the demand for 900 MHz spectrum;

- **Section 7** provides a summary of ComReg's options for spectrum release presented to date. This section also summarises the alternative options that were proposed by interested parties in their responses to consultations 08/57 and 09/14 and subsequent to the July 2008 bilateral discussions.

- **Section 8** details a revised option for liberalising the 900 MHz band, based on work carried out by ComReg and its expert advisers since consultation 09/14.

- **Section 9** contains ComReg's draft regulatory impact assessment on the spectrum release options proposed by ComReg as well as those put forward by respondents in the two preceding consultations.

- **Section 10** contains ComReg's evaluation of the various options proposed by ComReg and those from respondents in the two preceding consultations, from the perspective of particular regulatory objectives criteria and Policy Directions.

- **Section 11** sets out ComReg's proposed way forward and plans to proceed with the establishment of a competitive award process based on the single option put forward in Section 8.

- **Section 12** consults on ComReg's planned spectrum auction format for the release of spectrum in the 900 MHz band, the use of temporal lots, a process that allows early liberalisation as well as a set of draft auction rules to implement the proposed approach.

- **Section 13** puts forward proposed auction fees, the methodology used to determine these fees as well as how these fees could be structured to accommodate a deferred payment option.

- **Section 14** examines the coexistence of future and legacy services as well as realignment issues that may need to be addressed following the auction.

- **Section 15** puts forward a set of proposed licence conditions and potential licence commitments that may apply to these awards. This section also deals with the potential licence commitments raised in 09/14.

- **Section 16** provides details for interested parties on how to respond to this consultation.

- **Section 17** contains the following Annexes;
  - A glossary of terms used in this document;
  - A list of the consultation questions asked throughout this document;
  - A schedule of draft licence conditions based on the proposals contained in section 15;
  - The draft Memorandum of Understanding between ComReg and Ofcom referred to in Section 4;
  - An update on liberalisation actions across other EU Member States and other relevant jurisdictions;
  - A summary of alternative proposals suggested in responses to 08/57;
  - A corrigendum on current frequency assignments in the 900 MHz band;
  - ComReg's analysis of a regulatory impact assessment received from Vodafone and published in document 09/99s.

4 Update on Recent Developments in Europe

There have been a number of further developments in Europe relating to the use of the 900 MHz and 1800 MHz frequency bands since the publication of Consultation 09/14 and these are set out briefly below.

4.1 European legislation, EC Amending Directive and EC Decision

On 16 October 2009, two important pieces of legislation were adopted at a European level to allow the introduction of other terrestrial systems capable of providing electronic communications services that can co-exist with GSM systems. These are:

- a European Directive, Directive 2009/114/EC that amends the existing GSM Directive and removes the exclusive reservation of the 900 MHz band for GSM services (the "Amending Directive")[4]; and
- a European Commission (EC) Decision 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 (2009/766/EC) 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")[5].

The Amending Directive provides for Member States to make the 900 MHz band available for GSM and UMTS systems, as well as for other systems capable of providing electronic communications services that can co-exist with GSM systems. In implementing the Directive, Member States are required to examine whether the existing assignment of the 900 MHz band to competing mobile operators in their territory is likely to distort competition in the markets concerned, and where justified and proportionate, to address such distortions in accordance with Article 14 of the Authorisation Directive.

As a first step, in addition to GSM the EC Decision permits the use of the Universal Mobile Telecommunications System (UMTS) and other technologies capable of demonstrating compatibility with these systems, but it is acknowledged 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 has recently 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.

[4] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0025:0027:EN:PDF

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

The deadline for implementing both the Amending Directive and the EC Decision is 9 May 2010.

ComReg also notes recent changes to the European Common Regulatory Framework and considers that its proposals would be consistent with changes to the relevant Directives (noting that the precise nature of amendments to domestic legislation is yet to be decided)[6].

4.2 Liberalisation and Licensing Elsewhere in Europe

Since publication of Consultation 09/14, a number of EU Member States and other jurisdictions have progressed plans regarding the use of the 900 MHz and 1800 MHz spectrum bands and these are set out in Annex E.

While ComReg continues to monitor international, and particularly European developments, to inform its consideration of the issues, ComReg would reiterate the need for particular care to be taken to consider different national circumstances (including, without limitation, national legislation, market conditions, levels of competition in the market and available spectrum) before seeking to draw inferences or conclusions from developments elsewhere.

Bearing in mind the above, and in response to several claims that there was no international "precedent" for the use of auctions in relation to spectrum assigned to existing licensees (as is being put forward by ComReg), ComReg would note that this approach is, in fact, being adopted or considered by a number of European National Regulatory Authorities (NRA) in relation to spectrum and including the 900 MHz and 1800 MHz spectrum bands.

In relation to suggestions from certain respondents that ComReg should adopt an industry-oriented approach to future assignment of the 900 MHz band similar to that adopted in Sweden, ComReg notes from reports on the matter that the agreement adopted in Sweden is the subject of an investigation by the Swedish Competition Authority and separately of legal challenges from other commercial parties who considered themselves unfairly excluded from the process.

4.3 Outcome of Coordination Meetings with Ofcom

To facilitate the operation of adequate service near common national borders ComReg holds bilateral meetings with the United Kingdom's Office of Communications (Ofcom)[7] to agree the manner in which this occurs.

[6] Directive 2009/140/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2009 amending Directive 2002/21/EC on a common regulatory framework for electronic communication networks and services, 2002/19/EC on access to, and interconnection of, electronic communication networks and associated facilitiers, and 2002/20/EC on the new authorisation of electronic communications networks and services.

[7] Ofcom is the independent statutory body with responsibility for regulating the UK's broadcasting, telecommunications and wireless communications sectors.

Agreements between ComReg and Ofcom normally take the form of a Memorandum of Understanding (MoU) between the two administrations.

The use of the 900 MHz band for GSM services is currently covered by two MoUs and the use of the 1800 MHz band by GSM services by a single MoU. ComReg and Ofcom have agreed a draft MoU to facilitate the co-ordination of International Mobile Telecommunications (IMT) technologies in the 900 MHz and 1800 MHz bands (the "Draft MoU"). A copy of the current version of the Draft MoU is contained in Annex D.

The co-ordination of IMT/UMTS Frequency-division duplex (FDD) services is based on the agreed European approach contained in Electronic Communications Committee (ECC) Recommendation (08)02[8]. This ECC Recommendation also contains, in its Annex 4, the agreed preferential codes for IMT/UMTS (Universal Terrestrial Radio Access (UTRA) FDD).

Coordination of existing and future GSM usage will continue to be carried out at this stage under the existing MoUs. The Draft MoU defines a carrier field strength threshold below which no coordination is required and above which coordination is mandatory. Thresholds for 900 MHz systems and 1800 MHz systems are given for the case where systems are using preferential frequencies or where centre frequencies are not aligned. The Draft MoU also covers the establishment of bilateral agreements between operators, the method of propagation prediction to be used and the coordination procedure to be adopted where the coordination threshold has been exceeded.

ComReg intends to agree and adopt the Draft MoU with Ofcom as soon as mutually convenient.

[8] ECC Recommendation (08)02 Frequency planning and frequency coordination for the GSM900 (including E-GSM)/UMTS900, GSM1800/UMTS1800 Land Mobile systems, 21 February 2008.

5 Update on Bilateral Meetings with Respondents to 08/57 and 09/14

5.1 Bilateral meetings with parties that submitted responses to Consultation

Following the publication of Consultation 09/14 and in light of the importance of this consultation process and the number and complex nature of the issues involved, ComReg considered it desirable to provide an opportunity for interested parties to clarify their views as previously submitted in writing. To this end, ComReg invited each party that responded to one or both consultations (Consultation 08/57 and Consultation 09/14) to attend a meeting with ComReg where the invited party was given the opportunity to 'speak to' its written responses.

Ten parties availed of this opportunity, with meetings held between 1 July and 15 July 2009. Meeting participants (in alphabetical order) were:

- Digiweb Ltd;
- ESB;
- Hutchinson 3G Ireland Ltd;
- Imagine Communications Group Ltd;
- LM Ericsson Ltd;
- Meteor Mobile Communications Ltd;
- Qualcomm Europe Inc;
- Telefónica O2 Ireland Ltd;
- UPC Ltd; and
- Vodafone Ireland Ltd.

The non-confidential minutes to each of these meetings, as agreed between ComReg and the respective participant, are contained in ComReg Document 09/73 which was published on 28 September 2009.

Additional relevant correspondence and submissions received by ComReg since those meetings are contained in ComReg Document 09/99s.

5.2 Key Discussion Points

Based on the views expressed, interested parties can generally be divided into three categories:

- Existing GSM licensees;
- Mobile Network Operators (MNO) not holding GSM licence(s); and
- Other interested parties (including other potential new entrants to the 900 MHz and 1800 MHz bands).

5.3 Existing GSM Licensees

While ComReg has carefully considered all of the representations made by bilateral meeting participants, it would, in relation to existing GSM licensees, highlight the following key points:

- In general, these participants maintained their respective positions as articulated in their consultation responses;

- All asserted that severe consumer disruption would occur if one or both of the MNOs, with GSM 900 MHz licences due to expire in 2011, were unable to acquire any 900 MHz spectrum. The use of existing 1800 MHz spectrum holdings by these operators to mitigate claimed consumer disruption was not considered by them to be acceptable on the basis of coverage and cost implications. It appears that the risk of loss of any or all of a 900 MHz frequency assignment, even when it is acknowledged by one existing GSM licensee to be very small[9], is of primary concern to existing GSM licensees;

- In relation to the potential, although limited, possibility of loss of 900 MHz spectrum by one of these MNOs, existing GSM licensees maintained that no other single operator could cope with the increased traffic demand in rural areas;

- Concerning auction design, existing GSM licensees acknowledged the value in increasing the number of blocks made available in the first auction as this would reduce any 'artificial' spectrum scarcity;

- Some of the existing GSM licensees acknowledged that opportunity cost would be a sensible basis by which to determine the appropriate spectrum usage fee associated with any retention of spectrum allocations and short-term licence-renewal by licensees to address potential GSM legacy issues (i.e. potential consumer disruption), under ComReg's Option 2 as set out in Consultation 09/14. All recognised the problem of how to accurately establish this amount in advance of an auction. Another existing GSM licensee accepted that opportunity cost is a valid manner of setting such spectrum usage fees but submitted that only spectrum usage fees associated with liberalised spectrum should be based on opportunity cost.

- Existing GSM licensees accepted the need for a balance between upfront and ongoing spectrum usage fees. The main concern in this regard was that if the entire fee was payable upfront, then there would be no incentive to maximise the use of the spectrum going forward. Existing GSM licensees asked for ComReg to balance upfront and ongoing spectrum usage fees with such incentives in mind;

[9] Redacted minutes of bilateral meeting between Vodafone and ComReg published in document 09/73.

- There was no opposition to H3GI or any other new player being assigned 2 × 5 MHz of 900 MHz spectrum provided each of the existing GSM licensees was assigned 2 × 10 MHz of same in the first instance; and

- Arguments were again put forward concerning the demand for and release of 1800 MHz but with no new compelling evidence in support of these arguments.

5.4 MNO not Holding a GSM Licence

While ComReg has carefully considered all the representations made by bilateral meeting participants, it would, in relation to the MNO without an existing GSM licence, namely Hutchinson 3G Ireland Limited ("H3GI") highlight the following key points:

- H3GI stated that it is very serious about securing spectrum at 900 MHz and made it clear that its strategy was to obtain 2 × 10 MHz and not solely 2 × 5 MHz;

- H3GI is of the view that, even if ComReg were to set appropriate usage fees for renewal of any of the current GSM 900 MHz licences under ComReg's Option 2 in Consultation 09/14, the proposal is still fundamentally flawed and would fail on a state aid basis;

- H3GI asserted that ComReg by proposing Option 2 (in 09/14) is trying to solve the failings and problems of the incumbent MNOs with regard to their management of spectrum holdings and customer base, and ComReg should avoid doing so. It also submitted that, in any auction, ComReg should ensure: there is no market distortion and that all parties have equal access. H3GI considered that market distortions would only arise if existing GSM licensees were gifted an extension on their current licences; and

- In considering the various arguments put forward against Option 1, H3GI maintains that existing GSM licensees are erroneously focusing on the loss of all 900 MHz spectrum as compared to the loss of 2.2 MHz. It maintained that the loss of 2.2 MHz can be mitigated, as in areas where operators require more than 2 × 5 MHz at 900 MHz, each has a sufficient density of 1800 MHz base stations. In those rural areas served only by 900 MHz, traffic is lower and so MNOs would not each require the full 7.2 MHz currently held.

5.5 Other Interested Parties

While ComReg has carefully considered all of the representations made by bilateral meeting participants, it would, in relation to other interested parties, highlight the following:

- For many, their spectrum priorities are focused on other spectrum bands. In general order of preference: 3.5 GHz band (including the 10.5 GHz band for some), followed by the 2.3 GHz and 2.6 GHz bands in turn, and then only followed by the 900 MHz band and finally by the 1800 MHz band, assuming WiMax equipment becomes available in these bands;

- Most interested parties expressed keenness to enter the mobile market either through an MVNO or through their own network. As they considered that they will be outbid by existing MNOs in any auction for 900 MHz and/or 1800 MHz spectrum they favour some spectrum reservation for a new market entrant;

- One interested party clearly stated that it had no interest in acquiring spectrum at 1800 MHz as it did not believe it could effectively compete therewith against entrenched MNOs who hold 900 MHz spectrum.

6 Additional Matters Raised by Respondents

Several respondents to Consultation 09/14 raised matters not directly addressed in 09/14 or presented additional material related to Consultation 09/14. These matters can generally be categorised as follows:

- Long Term Evolution (LTE);
- 1800 MHz;
- Digital Dividend;
- Spectrum Trading; and
- Expectations surrounding certain statements made by the Office of the Director of Telecommunications Regulation (ODTR).

A summary of respondents' views, and ComReg's position in relation to each matter, is set out below.

6.1 Long Term Evolution (LTE)

6.1.1 Respondents' views

In the course of the bilateral meetings, and in response to Consultation 08/57 and 09/14, several parties contended that LTE deployment will occur in the immediate future, and that the timing and manner of certain radio spectrum releases should reflect the greater bandwidth likely to be required by this technology.

6.1.2 ComReg's View

ComReg recognises that, conceptually at least, LTE has the potential to further enhance the mobile broadband experience of users. However, there still remains much work to be done before LTE can move beyond the trial stage and on to full commercial deployment in Ireland. ComReg would therefore make a number of observations, based on currently available information, with regard to LTE.

Firstly, there is no clear roadmap of when LTE will actually be deployed, and perhaps more importantly, when user equipment may become available. Indeed, the information before ComReg indicates conflicting claims on this issue. The availability of user equipment is heavily dependent on economies of scale to ensure user equipment is priced in an affordable manner. Companies which have announced early adoption of LTE include NTT DoCoMo (Japan) (launch end 2010) and Verizon (US) (launch early 2010). It should be noted that operators which deploy networks in countries with such large populations are able to self-generate such economies of scale.

NTT DoCoMo intends to deploy LTE in its 1.5 GHz[10] spectrum assignment, whereas Verizon will deploy in its 700 MHz spectrum assignment. Other early

[10] Note that the use of the 1.5 GHz band for LTE is unique to Japan for the moment.

adaptors of LTE plan to use 700 MHz, 1.5 GHz and 2.6 GHz spectrum for deployments. The intention of these operators to deploy LTE in these frequency bands is likely to result in equipment suppliers focusing on generating user equipment in same. However, none of these frequency bands are available in Ireland at this time.[11] Therefore, it seems unlikely that LTE user equipment for 900 MHz and 1800 MHz frequency bands will become available in the immediate future. In this regard, ComReg notes that one researcher is of the view that LTE devices will initially be data only with data cards and USB modems, with LTE handsets capable of supporting voice not being available until 2012[12]. Indeed, Vodafone has stated "there will be no European LTE networks in 2010 except for a few small ones to demonstrate its capabilities to governments"[13], and so it will not roll out LTE networks until 2012 at the earliest.

Secondly, while LTE promises to deliver extremely high capacities, in its current form, throughput is only comparable to Evolved High-Speed Packet Access (HSPA+). There would therefore seem to be little motivation for an operator currently deploying HSPA to migrate its equipment to LTE at this stage. Indeed, one respondent submitted that existing GSM licensees will sweat their GSM assets as LTE is not standardised at this point, and HSPA is likely to be the technology of choice for some time to come. It is perhaps noteworthy that AT&T, which paid large fees for blocks of spectrum within the 700 MHz band in the USA, does not intend to roll out LTE at this time and does not plan to use its assignment commercially before 2011.

Thirdly, it is worth noting that the current LTE standard makes no provision for voice or SMS, where voice and SMS services currently account for 85% of global annual mobile services revenue. It is predicted that, even following LTE full deployment, these services will account for 77% of such revenue[14].

In addition, deployment of an LTE network will be a considerable expense and its success will be greatly dependent on the availability of affordable user equipment. Not surprisingly, many commentators believe that LTE will not become commercially available on a wide scale until handsets are available, with at least one commentator believing this will not occur before 2012[15]. For example, a recent independent report claims that the LTE market is not forecast to hit an inflection point for adoption before the 2012 to 2013 time frame, and also states that this is particularly the case in Latin America and EMEA

[11] E.g. 700 MHz spectrum is used for analogue TV broadcasting in Ireland; 1.5 GHz spectrum is used for fixed links and a large proportion of 2.6 GHz spectrum is used for MMDS services.

[12] Ovum – The LTE business case: Device Roadmap – 21 July 2009.

[13] Professor Michael Walker – Vodafone R&D executive.

[14] Aricent market report – LTE: Beyond the numbers published September 2009.

[15] GSA – Evolution to LTE (GSA information paper) confirms 51 LTE network commitments in 24 countries – published 10 December 2009.

(Europe, Middle East and Asia) where there are protracted time lines for 2.6 GHz and 700 MHz spectrum auctions[16].

Finally, LTE has yet to be approved for deployment in the 900 MHz and 1800 MHz bands in the European Union. While studies have recently commenced in CEPT to determine whether it and other technologies (such as WiMAX) can safely co-exist with GSM and UMTS technologies, the outcome of these studies are still some way from completion.

Taking all the above into account, and while recognising the tremendous potential of LTE, ComReg is currently of the view that LTE deployment in the bands under consideration is still some time away and that there are compelling reasons for ComReg to proceed with this licence competition at this time. ComReg is not in a position to wait for such developments but will continue to monitor the progress of LTE as it moves toward commercial deployment and adoption in Europe, and its implications for the licensing of relevant frequency bands.

6.2 1800 MHz Band

6.2.1 ComReg's position in Consultation 09/14

In Consultation 09/14 ComReg stated that holding a competitive award process for assignment of 1800 MHz frequencies closer to 2013 would provide greater clarity but also stated that it may have to alter its position should circumstances materially change.

6.2.2 Respondents' views

A number of respondents continue to petition for the immediate release of additional spectrum in the 1800 MHz band.

These respondents contend that many of the responses to Consultation 08/57 expressed demand jointly for 900 MHz and 1800 MHz spectrum, and submitted that while ComReg recognised demand for the former it had disregarded the latter. These respondents submitted that the lack of visibility of future 1800 MHz developments both deters investment and reduces the band's viability as an alternative option for incumbents which are at risk of losing 900 MHz spectrum. It was also submitted that release of same will mitigate the technological disadvantage that Ireland will experience when other European countries avail of the benefits of wideband technologies in the 2.6 GHz band.

Further, there were calls for ComReg to adopt a "holistic approach" to the manner and timing of spectrum release by, in particular, providing certainty on the future of any spectrum release associated with the "digital dividend" and the future availability of unassigned spectrum in the 1800 MHz band.

[16] Yankee Group Report – Demystifying Long-Term Evolution on the path to 4G – published July 2009.

In the bilateral meetings, one respondent indicated, in response to questioning on the 1800 MHz band, that it will be 2011 before operators see options in equipment availability and 2012 before any investment decisions need to be made and that they agree with ComReg's 'wait and see' position. This respondent further commented that the reason certain operators are eager to acquire 1800 MHz spectrum as soon as possible is an aggressive regulatory policy, covering their bases on future developments and muddying the waters around 900 MHz band.

Another respondent, when asked to speak to the timing of the release of this band and in particular its view for releasing earlier than 2013 given likely timelines for availability of LTE equipment, current spectrum assignments and their utilisation, responded by stating that in general, networks were built for coverage first, followed by capacity as and where required, as those involved with the build out of the GSM network would recall. This respondent indicated that the 900 MHz band was particularly valuable for rural rollout and better in-building coverage and that the 1800 MHz band was especially useful when used in combination with 900 MHz for handling extra load on the network. Concerning 1800 MHz, this respondent contended that the proposed release date of circa 2013 should be brought forward so as not to unduly delay the possibility of an LTE deployment in Ireland and to provide the industry with the necessary visibility so that investment decisions can be planned and made and on this basis prefers that ComReg takes action on 1800 MHz within one year at the very most.

6.2.3 ComReg's View

At present in Ireland, 1800 MHz spectrum is largely used to complement spectrum use in the 900 MHz band. In this regard, 1800 MHz spectrum is typically used in urban areas to support high levels of traffic and capacity in a network[17]. Outside of urban areas, 900 MHz spectrum is typically used to provide wide area coverage due to its favourable propagation characteristics and in-building penetration. In Ireland, three licensees currently hold 2 × 14.4 MHz of 1800 MHz spectrum, with little, if any, deployment outside the major urban centres where it is used for additional capacity.

As discussed in the previous section regarding LTE, ComReg is not aware of any credible evidence to support the conclusion that LTE equipment (operator and/or consumer) will become available in this band in the near future. Accordingly, calls for the release of additional 1800 MHz spectrum on the basis of immediate deployment of such technology must be seriously questioned, particularly in light of existing use of currently assigned 1800 MHz spectrum, which is low.

Equally, ComReg does not have any proof that equipment will become available for UMTS in the 1800 MHz band in the near future. Two of the biggest lobbying groups for UMTS, the UMTS Forum[18] and the GSA[19], in recently published documents make no reference to any plans for an operator

[17] A number of operators in the UK use 1800 MHz to provide a nationwide GSM service.

[18] UMTS Forum White Paper – UMTS/HSPA broadband services in the 900 MHz band: Strategy and Deployment – published May 2009.

[19] UMTS Global Status – GSM/3G Market/technology update – published 3 December 2009.

anywhere to test or launch UMTS in the 1800 MHz band. Indeed, ComReg is not aware of any equipment entering the market to support UMTS in 1800 MHz in the foreseeable future. This could be due to the proliferation of base station equipment and user devices operating in the 2100 MHz band, creating the economies of scale. There is a marginal increase in favourable propagation characteristics when deploying 1800 MHz in place of 2100 MHz.

ComReg is mindful of the risks of premature release of spectrum. If there are not genuine opportunities promptly to use 1800 MHz spectrum for deployment of new technologies and services, the only parties likely to seek to acquire such spectrum would be incumbent MNOs wishing to safeguard their long-term strategic position, to the detriment of potential new entrants. This would mean they could acquire their spectrum in conditions of artificially low competition, and furthermore could potentially constrain future market development.

In relation to 900 MHz spectrum, ComReg is of the view that there is objectively justified demand for liberalised 900 MHz spectrum (noting actual UMTS equipment availability at 900 MHz and likely spectrum scarcity), in contrast to the situation at 1800 MHz, and so ComReg has prioritised its spectrum release activities in favour of 900 MHz at this time. Following the release of 900 MHz spectrum, ComReg will further assess the basis for the release of 1800 MHz spectrum using available information at that time. ComReg is mindful, given the pace of change in electronic communications networks and services, that the situation could evolve speedily to a point where it may be appropriate to hold a competition for access to 1800 MHz spectrum much sooner than 2013. ComReg will respond as it may consider appropriate should circumstances materially change.

6.3 Digital Dividend

Based on the interest expressed to date, it is predicted that any spectrum released as a result of the Digital Dividend, most likely in the 790 - 862 MHz band given current European developments, will be highly sought after given its excellent propagation (including building penetration) characteristics.

6.3.1 ComReg's View

ComReg recently set out its current thinking on the Digital Dividend in Ireland in Response to Consultation Document 09/81. Along with many respondents to the GSM liberalisation and Digital Dividend consultations, ComReg believes that digital dividend spectrum must be managed effectively and used efficiently in order to maximise the benefits to Ireland. ComReg will further develop its position with respect to the Digital Dividend and will consult further, having regard to developments at a national and international level.

A number of respondents put it to ComReg that it should take a 'holistic' view of all spectrum likely to be relevant to UMTS and LTE services over the next few years, and provide certainty on the future release of Digital Dividend spectrum in the 800 MHz band. ComReg readily acknowledges the relevance of the Digital Dividend bands for the future availability of advanced mobile

services in Ireland, and is aware of the potentially complementary or substitution use of the various bands designated for UMTS and likely-to-be-designated for LTE, including 800 MHz. However ComReg notes that before the Digital Dividend could be released in Ireland, Analogue Switch Off (ASO) would need to be announced and then effected, which would likely require a very high provision of digital broadcasting services to be prevalent across the country. A spectrum award process would need to be developed in consultation with all the stakeholders. Following such an award and the event of ASO, a number of other steps would be needed, including digital-to-digital refarming of the relevant spectrum, before the Digital Dividend could actually be used for qualifying new services. The European recommended timetable for ASO suggests a deadline of 2012, a year after the first expiry of licences at 900 MHz in Ireland. To date there has been no launch in Ireland of a Digital Terrestrial Television service, nor any firm commitment to an ASO date. For these reasons it is not practical at this time for ComReg to provide the requested certainty on the future release of Digital Dividend spectrum in Ireland.

Nevertheless, ComReg will endeavour to provide as much visibility regarding ASO and Digital Dividend developments going forward.

6.4 Spectrum Trading

One respondent noted a reference by Department of Communications, Energy and Natural Resources that spectrum trading will be a "core principle" of future legislation[20]. In light of this particular reference, this respondent submitted that it would be premature of ComReg to make a decision which "hard fastens" the use of 900 MHz spectrum for 15 years without consideration of upcoming policy developments.

Spectrum trading has won support in some quarters and some of its advocates are also respondents to this consultation process. Similar points to those received in response to Consultation 08/57 were raised with many spectrum trading proponents arguing that such a market-based system would be central to ensuring that spectrum is assigned in the most efficient manner possible (on the premise that the person which values spectrum the highest is likely to make the most efficient use of the spectrum).

Spectrum trading is also seen by its proponents as a useful means of minimising "spectrum hoarding", whereby in an environment where spectrum trading is not allowed there may be incentives to hoard spectrum so as to reduce the amount of spectrum available to others and limit competition.

6.4.1 ComReg's view

There are currently no legislative provisions which enable spectrum trading to occur in Ireland.

[20] http://www.dcenr.gov.ie/NR/rdonlyres/7691C849-3049-4C29-ACEF-5FD4518B04E4/0/SpectrumGroupReport050908RORFinal.doc

As previously noted in Consultation 09/14, the introduction of a spectrum trading regime in Ireland is a matter for policy makers and the legislature.

In relation to the present matter, ComReg is obliged to make decisions which are, amongst other things, objectively justified and proportionate at this point in time, having regard to future developments that are sufficiently certain upon which to base its decisions. In relation to spectrum trading, ComReg notes that enabling legislation is not being considered at this point, and it can therefore be assumed that a spectrum trading regime will not apply in Ireland at least in the near future.

Mindful of this, it would not be reasonable or appropriate for ComReg to unnecessarily delay the release of spectrum in the 900 MHz band based on the potential introduction of spectrum trading in Ireland in the long term, or base decisions regarding the nature of 900 MHz spectrum release, which will have immediate bearing on actual and potential market operators, on conditions which are far from certain.

6.5 ODTR's statement regarding the possibility of future renewal of GSM 900 MHz and 1800 MHz licences

In Section 4.1 of its Response to Consultation and Further Consultation paper, issued on 10 March, 2009 in document 09/14, ComReg responded to submissions made by various respondents (the "GSM licensees"), concerning entitlements they claimed relating to possible 2G licence-extension or renewal following expiration of their respective 2G licences, on the basis of a statement made by ComReg's predecessor, the Office of the Director of Telecommunications Regulation (or "ODTR"), in an information memorandum in 2001 (document number 01/96) ("the Director's Statement").

The Director's Statement relied upon by the GSM licensees was as follows:

> *"Continued availability of existing spectrum assignments in the 900 MHz and 1800 MHz bands to mobile telecommunications licensees will be reviewed three years prior to licence expiry. Retention of such spectrum will be on a demonstrable need basis until the end date of the 3G licences."*

Amongst other things, it should be noted here that this statement was one of a number made at that time. It was also the case that the Regulations and Licences made following these indicative policy pronouncements did not refer to the Director's Statement and did not seek to provide for it to take effect, or to make provision consistent with it.

On the basis outlined in Consultation 09/14, ComReg stated that it did not consider that it ought to proceed on the basis of the GSM licensees' particular views of the meaning and effect of the Director's Statement. In that regard, ComReg eschewed the notion that it was obliged necessarily to conduct a process leading to extension or renewal of 2G licences on expiry, on the basis of the GSM licensees satisfying a 'demonstrable need' criterion, in circumstances where ComReg might not consider this to be the option it found most attractive

in the current exercise of its statutory powers, functions and duties, and in pursuit of its objectives as provided for by law, having regard to present-day facts and circumstances.

ComReg's expressed position in Consultation 09/14, therefore, was that it did not consider itself constrained in the manner contended by the GSM licensees in their responses to Consultation 08/57, and in their submissions generally. In expressing that position, ComReg also made it clear that this did not mean that it would not review and consult in relation to future spectrum assignments in the 900 MHz and 1800 MHz frequency bands, and that this was part of the process instigated in Consultation 08/57 in July, 2008.

With regard to the foregoing, ComReg has, by means of the consultation process commenced in 08/57, and continued in 09/14 and this document, been reviewing spectrum assignments and the future use of spectrum in the 900 MHz and 1800 MHz bands, and has been asking questions, putting up, seeking, evaluating and developing further options, and inviting, entertaining and considering submissions from respondents.

The responses and submissions made to date have included responses and submissions on the parts of the GSM licensees, seeking to convince ComReg that it was required to proceed on the basis of the Director's Statement, and on their particular understanding of its meaning and effect. These responses and submissions have sought, amongst other things, to demonstrate a need for the continuation of their respective spectrum assignments beyond the expiry dates of their respective 2G licences, as well as to demonstrate the consequences - both for themselves, and generally - that would flow from any decision not to extend or renew their 2G licences, together with their associated spectrum allocations, upon expiry.

ComReg has had careful regard to these submissions, as well as to the assertions of the GSM licensees concerning their harbouring expectations of licence-renewal. In this regard, ComReg has considered and assessed various options in the process to date, taking into account the expectations expressed by the licensees concerned, as well as their submissions generally. These options include particular alternatives put forward by respondents; an option based on possible short-term licence-extension or renewal following 2G licence-expiry (Option 2 in Consultation 09/14) with a view to staged transition from 2G use of the 900 MHz band to fully-liberalised use, taking into account any 'legacy issues'; and an option based on a particular implementation of elements in the Director's Statement.

Whilst ComReg had clearly stated in Consultation 09/14 that, although consulting in relation to, and reviewing, spectrum assignments (and accordingly also having regard to licensees' expressed expectations in that regard), it did not intend in this process to proceed on the basis of the Director's Statement in the manner contended by the GSM licensees, nevertheless, a number of respondents continued to make submissions regarding the matter after the publication of 09/14.

ComReg has considered these further submissions carefully from various points of view. It has considered the claims made by the GSM licensees - by reference to the doctrine of legitimate expectations - to an enforceable right to 2G licence-extension or renewal on the basis of satisfaction of a 'demonstrable need' criterion. ComReg has also considered these submissions from the point of view of ComReg reviewing spectrum-assignments, and has further taken into account in its deliberations the fact of the expectations claimed to be held by the GSM licensees and the various submissions made by them regarding the impact of any 'non-delivery' by ComReg on what they claim to be the true meaning and effect of the Director's Statement.

Having regard to all of the foregoing and the current facts and circumstances of relevance, as well as to the advices of its consultants and the material before it, ComReg has arrived at a position whereby it is satisfied that the GSM licensees' do not enjoy an enforceable legal right to 2G licence-renewal or extension. Furthermore, ComReg has arrived at a position in which its preferred proposal and option in the exercise of its statutory-conferred discretionary decision-making functions is a modification of Option 1 in 09/14 ("Modified Option 1").

In reaching its core conclusion on the legitimate expectations issue, ComReg has had regard to a wide range of factors which include but which is not limited by the following:

a) The fact that the obligations, powers and discretions enjoyed by ComReg are imposed and conferred by statute;

b) The fact that the Director's Statement was made in circumstances where the Information Memorandum in which it was contained was itself attended by disclaimers and caveats, and which expressly indicated that it did not contain the Director's final position on any matter in the 3G licensing process;

c) The Director's Statement was not reflected or incorporated by the ODTR into its subsequent 3G tender documents or relevant licences or GSM regulations, a fact which went without comment or complaint from the GSM licensees.

The selection of Modified Option 1 as its preferred option has been arrived at in circumstances where options put forward by the GSM licensees – including one based on a particular implementation of elements in the Director's Statement – as well as Option 2 in Consultation 09/14, have been considered, assessed, and rejected on the merits, and having regard to relevant facts and circumstances, materials and advice.

Accordingly, notwithstanding the expressed expectations and submissions of the GSM licensees, and its consideration of two different options involving 2G licence-extension, ComReg has decided in principle to exercise its statutorily-conferred discretions in the manner more particularly described in Section 10, on the basis that it considers the solution there set out to represent the best option it can reasonably identify at the current time and in the particular current

circumstances, in furtherance of its statutory remit and the particular discretions vested in it, in the public interest.

The selection of Modified Option 1 as its preferred option also, of course, involves ComReg rejecting the contention that the doctrine of legitimate expectations would apply in the current circumstances to require ComReg to choose an option that would facilitate 2G licence-renewal or extension in the manner contended for by the GSM licensees.

In that regard, as mentioned earlier in this section, ComReg had considered the question of its freedom to choose options in the exercise of its statutory discretionary decision-making in the light of the submissions and representations made by the GSM licensees in response to Consultation 08/57. As further mentioned earlier, ComReg had concluded that those submissions and representations did not satisfy ComReg that it ought to consider itself shackled to, or fettered by, the GSM licensees' particular views as to the meaning and effect of the Director's Statement, and, having set out a number of considerations relevant to that conclusion, ComReg so stated in the final paragraph in Section 4.1 of Consultation 09/14.

While ComReg had already clearly set out its view on the legitimate expectations issue in document 09/14, ComReg points out that the further submissions and representations made by the GSM licensees following on from, and in relation to, ComReg's above-mentioned conclusion in 09/14 have not served to alter its view in this regard. Non-confidential versions of the particular GSM licensees' further submissions and representations in this regard are contained in ComReg document 09/51s, and it is not proposed to set them out repetitively in this document[21].

In forming its view on the further submissions and representations of the GSM licensees on this issue, ComReg was, again, cognisant of the various factors referred to in Section 4.1 of Consultation 09/14, which it still regards as being of relevance to the determination of the issue. Having carefully considered the further submissions and representations of the GSM licensees, ComReg does not consider its understanding of the effect of those factors and all applicable considerations to be undone to the extent that a legitimate expectations claim could properly be made on the basis of the reasons advanced, and matters highlighted, by the GSM licensees.

6.6 Potential for Consumer Disruption

Given the ubiquity of mobile services in Ireland, ComReg recognises that the expiry of existing GSM 900 MHz licences could create the potential for some mobile consumers to experience disruption to their mobile services. This issue

[21] Note that references in this section to the GSM licensees' submissions and representations are not intended to indicate that all such licensees made the same submissions and representations. For convenience, they are referred to cumulatively in the text of this section, and without discriminating between the submissions and representations actually made by particular, individual, licensees. The individual submissions are available in ComReg document 09/51s.

was raised by the existing licensees as being of very high importance. Given ComReg's statutory objective to promote the interests of users ComReg has given the potential for consumer disruption considered and reasoned analysis. There are a number of factors of relevance in this discussion which relate firstly to the probability of disruption occurring and if it does occur the extent of such disruption, e.g. how many customers are likely to be affected.

As ComReg intends to issue new licences in the 900 MHz band in blocks of 2 × 5 MHz with a spectrum cap of 2 × 10 MHz the context of this discussion is in relation to whether existing GSM licensees gain access to two blocks of liberalised 900 MHz spectrum, one block or none or all.

It is also of relevance in this discussion to consider the status of the three existing GSM licensees. Meteor's existing GSM 900 MHz licence does not expire until mid-2015. Therefore it is ComReg's view that Meteor can be considered in a different light to the case of O2 and Vodafone. Meteor has a guaranteed presence in the 900 MHz band until mid-2015 and thus has a much longer period of time to deal with the consequences of the outcome of an auction. Each of the mitigation factors discussed below can be pursued by Meteor over this time period. In addition, other spectrum is likely to be available by mid-2015 which creates further alternative opportunities for Meteor. For these reasons Meteor is not considered any further in the context of a discussion about the potential for consumer disruption.

For the purpose of this discussion ComReg is focusing on the situation regarding the two other GSM licensees – O2 and Vodafone. Together these operators account for 74% of all mobile subscribers (excluding HSDPA).

One possible outcome of a competitive assignment process is that O2 and Vodafone are each awarded one 2 × 5 MHz block of spectrum. This implies that the other five blocks of spectrum go to other operators (e.g. Meteor, H3GI or new entrants to the Irish market). If this situation arises, ComReg is of the view that there would be almost zero risk of customer disruption. With both O2 and Vodafone having 2 × 5 MHz of liberalised 900 MHz each, this would be 2.2 MHz less than their current assignment which is for GSM purposes only. Both operators would still have their spectrum at 1800 MHz and 2100 MHz. ComReg has made the reasonable assumption that both O2 or Vodafone would have every incentive to ensure that their existing customers do not suffer any disruption by undertaking reconfigurations of their network. It is incorrect to imply that customers will automatically face disruption if either Vodafone or O2 were to only win one block of spectrum each. Therefore this situation is not considered any further.

Another possible outcome of a competitive assignment is if Vodafone was to win no spectrum blocks and O2 was to win one 2 × 5 MHz block or vice versa. This implies that six of the seven spectrum blocks are awarded to other operators. In other words, it implies that there are a minimum of three other operators in the band. ComReg is of the view that this is a highly unlikely scenario given the large customer base which both O2 and Vodafone have which provides them with a major incentive to acquire spectrum to continue serving these customers.

Another possible outcome of a competitive assignment is if both O2 and Vodafone were to win no spectrum blocks. This implies that all seven spectrum blocks are awarded to other operators. In other words, it implies that there are a minimum of four other operators in the band. Again ComReg is of the view that this scenario is even less likely to arise for the same reasons as above - the large customer base which both O2 and Vodafone have.

The next issue to consider is in either of the last two possible outcomes (which in themselves are very unlikely outcomes), whether customer disruption would materialise in these cases. It is incorrect to imply that customers will automatically face disruption if Vodafone was to win no spectrum and O2 was to win one block, or vice versa, or if both operators were to win no spectrum. The important factor in this context is the degree to which O2 and/or Vodafone utilise the range of mitigation factors which are available to them. ComReg discussed a number of mitigation factors in both Consultation 08/57 and 09/14. If one of the two aforementioned scenarios was to arise, both O2 and Vodafone have a very high incentive to make use of these mitigation factors to ensure that their customers do not face disruption. Through the proper use of mitigation factors O2 and Vodafone will to a large extent be able to reduce any potential for their customers to experience disruption to a very low and possibly negligible level. Each operator's customer base is one of their most important assets and each operator has every incentive to ensure that their customers do not have reason to switch to another operator.

6.6.1 Mitigation Factors

Before considering each of these mitigation strategies in turn it is important to note that while each strategy is likely to incur a cost on either O2 or Vodafone or both, these costs should be taken into account by the respective operators when participating in a competitive assignment process. These operators will factor in the costs associated with not winning spectrum at 900 MHz and undertaking mitigation factors into their bid for a liberalised licence. Customers should not be negatively affected by these costs however as with the entry of new operators into the market, O2 and Vodafone will not be in a position to simply pass on these costs to their customers who can easily switch to alternative operators.

The existing GSM licensees dispute ComReg's view on the effectiveness of the mitigation factors. These arguments are addressed below.

It is also of course quite possible that additional measures to mitigate consumer disruption, not yet identified by ComReg or by consultation respondents, would emerge if the need should arise; as previously observed, industry players will want to take care of customers for the usual business reasons, and will have the opportunity to plan and implement such measures as they deem appropriate.

6.6.2 Use of Alternative Spectrum

The most important mitigation strategy available to O2 and Vodafone is the use of their other spectrum holdings at both 1800 MHz and 2100 MHz. ComReg is of the view that it would be technically feasible for both O2 and Vodafone to maintain continuity of their GSM services through the use of these spectrum holdings if either or both were to win one block or no blocks of liberalised 900 MHz spectrum. In forming this view, ComReg has taken into account a number of factors. ComReg has also considered the arguments raised by the existing licensees regarding the cost and time associated with developing 1800 MHz and 2100 MHz networks to compensate for the "loss" of 900 MHz spectrum.

In the case of 1800 MHz spectrum, both O2 and Vodafone have access to 1800 MHz spectrum for a further four years after the expiry of their 900 MHz licences. Their current 1800 MHz networks cover approximately 53% of the population, which includes all the major cities (Dublin, Cork, Galway, Waterford and Limerick). Whilst O2 and/or Vodafone would most likely have to incur some costs to extend their 1800 MHz network to obtain an equivalent level of coverage as they have with their 900 MHz network, the fact is that it is technically feasible to replicate a 900 MHz network. Also all GSM handsets are dual band so this strategy would not require O2 or Vodafone to subsidise handset upgrades.

There are examples of operators in other countries who provide nationwide GSM mobile services using only 1800 MHz spectrum, and no 900 MHz spectrum (e.g. T-Mobile and Orange in the UK). While it is accepted that there are differences between a 'greenfield' situation into which infrastructure is built as against a 'brownfield' situation in which infrastructure has already been built, it would be quite possible to provide national coverage in Ireland too, solely through the use of 1800 MHz and 2100 MHz spectrum.

In the case of 2100 MHz, this is also another option available to O2 and Vodafone. Current coverage at 2100 MHz is over 90% for both O2 and Vodafone. This strategy would require that customers have a 3G handset therefore the operator may have to accelerate the upgrade of its customers who have a GSM only handset to a 3G handset. This would involve costs associated with handset upgrade subsidies however such costs are likely to be incurred at some stage in the near future if O2 and Vodafone intend to phase out GSM.

Certain respondents to Consultation 08/57 suggested that the timeframe to reconfigure their networks from the use of 900 MHz spectrum to using their other spectrum assignments is very short. In response to Consultation 09/14, one respondent restated its claim that it would take four years to extend the use of its 1800 MHz network coverage. ComReg believes that this timeframe is overstated. In this regard, ComReg notes the views of another respondent which submitted that it had completed a changeover of its Radio Access Network (RAN) infrastructure within six months without disruption to customers, and cited the example of one of the existing GSM operators who apparently completed two major changeovers on its 2G and 3G networks within a two year

time period. It is quiet possible that the period required for change over could be further reduced should the need arise.

6.6.3 Roaming or MVNO Agreement

Another mitigation strategy available to O2 and Vodafone is to negotiate a Mobile Virtual Network Operator (MVNO) arrangement and/or roaming arrangement with a new holder of liberalised 900 MHz spectrum. The existing GSM licensees argued that the lack of certainty that an operator would be able to conclude a MVNO agreement or a roaming agreement with another operator makes this strategy unworkable.

If O2 and Vodafone were to win no spectrum or only one block between them, this means the likelihood of Meteor and H3GI being awarded spectrum at 900 MHz is quite high. Both O2 and Vodafone could seek to establish a roaming agreement with either Meteor and H3GI, who both have an existing network.

6.6.4 Mobile Number Portability

Another mitigation strategy available to O2 and Vodafone is to use the MNP process to facilitate their customers switching to other networks if they are no longer able to serve them. The existing GSM licensees argued that the MNP process is not designed for the mass migration of customers across different networks. ComReg is of the view that any switching that may occur will be over a period of time and hence the likelihood of such a 'mass migration' event is extremely low.

6.6.5 Demand and Supply Side effects

Vodafone and O2 are in control over the extent to which they choose to utilise these mitigating factors. ComReg is of the view that both operators have very high incentives to utilise these factors to their fullest extent in their interest of retaining their customers. However ComReg has also considered the impact on consumers should one/both operators choose not to utilise the mitigating factors. This can be considered from both a demand side - how will consumers react – and from a supply side – how will other operators react.

On the demand side, take for example the situation where both O2 and Vodafone fail to win any spectrum and both fail to take any measures to reduce the potential impact on their customers. As noted earlier, this scenario implies that there are a minimum of four operators who gain new liberalised licences and have outbid both O2 and Vodafone. In the first instance, O2 and Vodafone's GSM customers would still be able to use 1800 MHz spectrum. Both O2 and Vodafone's 1800 MHz networks cover over 50% of the population and cover all the major cities, and both have 3G networks which cover 90% of the population. Customers in these areas should not be affected. Also any

customers who have 3G handsets would be able to use 2100 MHz and also will not be affected. This leaves customers who are based outside the main cities who do not have a 3G handset who are those who may experience a decrease in the quality of the mobile service they receive. For these customers, they will have the choice to remain with O2 or Vodafone and/or upgrade their phone to 3G or to switch to an alternative operator. As noted earlier, there will be other operators with 900 MHz licenses so customers may choose to switch to these operators. Given how valuable an established customer base is, ComReg is of the view that this is extremely unlikely to occur. Both O2 and Vodafone have every incentive to minimise any disruption to their customers or take measures to compensate them if disruption does occur.

On the supply side, if both O2 and Vodafone fail to win any spectrum this implies that there are a minimum of four operators who gain new liberalised licences and have outbid both O2 and Vodafone. These operators could include Meteor, H3GI and new entrants. These operators will have every incentive to fight aggressively for the O2 and Vodafone's customers. These operators will have liberalised licenses for 900 MHz spectrum and will have every incentive to use their spectrum intensively to exploit the cost advantages they will have over O2 and Vodafone. While a new entrant to the Irish market may take longer than the likes of Meteor and H3GI to roll out a network at 900 MHz, both Meteor and H3GI, if they are successful bidders in the auction, will be in a position to immediately exploit the cost advantages of liberalised 900 MHz spectrum and compete intensely with O2 and Vodafone. These operators can use the MNP to their advantage to ensure customers of a smooth and hassle-free switchover process.

The only limiting factor is to what extent Meteor and H3GI's existing networks would be capable of serving a very large increase in the number of subscribers on their networks, in the very unlikely event that there were to be a large exodus of customers from Vodafone and O2 to the two other established networks (for example customers living outside the main urban areas who do not have a 3G handset).

6.6.6 Conclusions

ComReg recognises that the expiry of the existing GSM licences and the award of new licences via a competitive process creates the potential for consumer disruption under certain outcomes. ComReg has considered the likelihood or probability of consumer disruption occurring by first considering the outcomes where it could occur. ComReg has found that the likelihood of O2 and Vodafone not winning spectrum in a competitive award is very low. ComReg also considered the mitigating factors which are available to O2 and Vodafone in the unlikely event that they failed to win any spectrum. ComReg is of the view that these operators have every incentive to ensure that their customers are not negatively affected if they fail to win spectrum. ComReg also considered the unlikely situation whereby O2 and Vodafone choose not to take any mitigating strategy. The demand side and supply side analysis indicates that such an approach would not make commercial sense for either O2 or Vodafone to pursue.

ComReg is of the firm view that the arguments that the existing licensees raised regarding the potential and extent of customer disruption are significantly overstated. For the reasons discussed previously, and in light of ComReg's position of providing fair, proportionate and non-discriminatory opportunities to incumbents and potential entrants alike to gaining liberalised 900 MHz spectrum, ComReg is of the view that arguments relating to the potential for customer disruption are by no means an adequate justification for spectrum retention by incumbent GSM licensees.

6.7 Road map for upcoming spectrum release in other bands.

In its *Spectrum Management Strategy Statement*[22],for the period 2008 to 2010, ComReg detailed its current view on the planned release of spectrum in the short to medium term.

Since the publication of 08/50 in July 2008, much has changed in the global economic climate. In the interest of providing guidance for parties that may be seeking to participate in a competition for 900 MHz spectrum, ComReg presents the following indicative dates for upcoming spectrum awards:

Frequency Band	Release planned
825 - 890/935 - 960 MHz (900 MHz band	circa 2013
1710 - 1785/1805 - 1880 MHz (1800 MHz)	circa 2013[23]
790 - 862 MHz (Digital Dividend)	circa 2015[24]
2300 - 2400 MHz	2010
2500 - 2690 MHz (2.6 GHz)	circa 2013 or 2018[25]

Table 2 Indicative dates for upcoming spectrum awards

6.8 Demand for 900 MHz spectrum

In Consultation 09/14, ComReg, at various places, expressed its view that demand for liberalised 900 MHz spectrum is likely to exceed supply. For instance:

- "In contrast to many of the countries where licence renewal or extensions were granted as a prelude to possible spectrum re-distribution, Ireland has 13.4 MHz of unassigned 900 MHz spectrum. It is important to note that irrespective of the availability of this unassigned spectrum, the comments received from respondents to the Consultation indicate that demand for spectrum is likely to exceed

[22] ComReg (2008) Spectrum Management Strategy: 2008 – 2010, 1st July 2008, ComReg Document 08/50.

[23] Potentially earlier – see Section 6.2 of this document.

[24] Contingent on analogue TV switch off and digital switchover. This date may also change.

[25] To be decided in 2010.

supply. A total of six operators have expressed an interest in acquiring spectrum in the 900 MHz bands. The combined level of demand expressed exceeds 2 × 40 MHz in the 900 MHz band where there is only 2 × 35 MHz available in total." and

- "In relation to the "alternative option of licence renewal or reinstatement through direct administrative assignment", the latter being a reference to the DCENR's Report of the Working Group on Spectrum Policy, ComReg notes that the same report refers to the use of market mechanisms, primarily auctions, normally where the number of spectrum rights are limited. In the present context, ComReg reiterates its opinion that demand for 900 MHz spectrum is likely to exceed supply. Furthermore, ComReg does not believe that the use of auctions in such circumstances would be disproportionate in any reasonable interpretation and application of that concept. ComReg believes that it would not be fair, proportionate or reasonable to somehow favour current holders of licences in any bidding process. Even the suggestion that such discriminatory action would be contemplated could damage the reputation of Ireland from an investment perspective. Market participants and potential new entrants need to have full confidence in the character of telecommunications regulation in Ireland."

6.8.1 Respondents' views

ComReg received three written responses to 09/14 in relation to ComReg's view on this issue. In addition, several views were expressed during the course of bilateral meetings. In summary, several responses:

- questioned the basis for ComReg's belief that demand would likely exceed supply for 900 MHz spectrum, on the basis that:
  - there was not a robust or relevant definition of excess demand, particularly in circumstances where there is not yet an indication of the reserve price for a spectrum block;
  - expressions of interest in a consultation context are largely costless for respondents to make, and do not commit respondents in any way to subsequent participation in a spectrum award process; and
  - there is no substantive evidence that would support ComReg's position;
  - called upon ComReg to carry out a review immediately with the aim of establishing real demand for spectrum in the 900 MHz and 1800 MHz bands. In this regard:
  - one respondent suggested that ComReg had full powers to demand any and all information from petitioners and should be in a position to weigh the credentials of each party expressing an interest in order to evaluate the robustness of the interest being expressed; and

- questioned ComReg's reliance upon its view regarding the likelihood of excess demand as the basis or justification for an auction "solution" at this time.

On the other hand, another respondent in its bilateral meeting with ComReg stated that demand clearly exceeds supply when just considering current MNO's in the market, the amount of spectrum available and that an auction was the best way to proceed.

6.8.2 ComReg's Response

ComReg welcomes all respondents' views on this issue.

As detailed in its Spectrum Management Strategy Statement[26], ComReg does not favour any specific approach for awarding spectrum rights, but considers each award on its merits when determining the manner in which spectrum rights are to be awarded. Generally, when determining the most appropriate spectrum allocation method, a range of considerations are taken into account as relevant, including the size and scale of the Irish market, public policy considerations, social considerations, economic and market considerations, legal requirements and expected demand and use.

In recent years, ComReg has developed new licensing regimes based on first-come-first-served (e.g. Fixed Wireless Access Local Area (FWALA)), "beauty competitions" (e.g. FWALA and the fourth 3G licence), and auctions (e.g. the 26 GHz National Block Licence Awards). In ComReg's experience, auctions have proven to be quick, fair and transparent and, perhaps as a result of these attributes, less prone to legal challenge compared to other formats.

ComReg notes that certain respondents have called upon ComReg to ascertain, with certainty, whether or not demand will exceed supply for liberalised 900 MHz spectrum and, following this, whether an auction would be required.

First, as a general principle, ComReg's position is that the issue of spectrum scarcity is relevant to determining whether a competitive spectrum assignment process, including but not limited to an auction, would be required in the circumstances. This is particularly the case given that ComReg is obliged to ensure, amongst other things, non-discriminatory access to spectrum in any award process, and the efficient use of spectrum.

In this regard, ComReg would draw attention to Regulation 23 of the Framework Regulations, which provides that ComReg shall "..subject to any directions issued by the Minister pursuant to section 13 of the 2002 Act, ensure the effective management of radio frequencies for electronic communication services in accordance with section 12 of the 2002 Act and ensure that the

[26] ComReg (2008) Spectrum Management Strategy: 2008 – 2010, 1st July 2008, ComReg Document 08/50.

allocation and assignment of such radio frequencies is based on objective, transparent, non-discriminatory and proportionate criteria.

ComReg further notes Recital 22 of the Authorisation Directive, which states[27]:

"Where the demand for radio frequencies in a specific range exceeds their availability, appropriate and transparent assignment procedures should be used to avoid any discrimination and optimise the use of those scarce resources".

Regulation 11 of the Authorisation Regulations further provides that where ComReg decides that the number of licences in a particular class is to be limited, ComReg shall
"grant such licences on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate and which give due weight to the achievement of the objectives set out in Section 12 of the Act of 2002."

Further, the Amending GSM Directive specifically requires ComReg to examine whether existing allocations to mobile operators are likely to distort competition in the markets concerned, and where justified and proportionate, to address such distortions in accordance with Article 14 of the Authorisation Directive.

Against this background, ComReg remains of the view that where demand is likely to exceed supply for spectrum that it would be contrary to its obligations of objectivity, transparency, non-discrimination, fairness, proportionality and/or reasonableness to somehow favour current holders of licences, on the basis of their incumbency alone, in any spectrum assignment process.

ComReg notes that certain respondents have called on ComReg to establish, with certainty, the real level of demand for 900 MHz spectrum prior to the holding of any competition, and before seeking to rely on this as justification for using an auction mechanism.

ComReg would respond to these submissions as follows.

ComReg's extensive experience in running a variety of different spectrum assignment competitions has shown that it is not possible to conclusively determine the real level of demand in advance of a competition. For example, in one case, 5 parties which expressed an interest in a particular auction for spectrum did not appear on auction day and 3 completely different parties, which had not previously expressed an interest, bid and won all the licences on offer. In another more recent case, a party which was offered a licence

[27] Recital 22 of Authorisation Directive (2002/20/EC). See also Recitals 19 and 22 and Article 9.1 of the Framework Directive (and Regulation 23(1) of the Framework Regulations (as amended); Recital 12 and, of particular relevance in present circumstances, Recitals 22 and 23 of the Authorisation Directive; and Articles 5.2 and 7 of the Authorisation Directive (Regulation 9(4) of the Authorisation Regulations); and Recital 11 and Article 4 of Commission Directive on competition in the markets for electronic communications networks and services (2002/77/EC), the latter of which prohibits Member States from granting exclusive or special rights of use of radio frequencies for the provision of electronic communications networks.

withdrew from the auction after an offer was made and, in the process, forfeited a substantial deposit.

Respondents have suggested that a "review" be conducted by ComReg, or that ComReg make use of mandatory information gathering powers. It is noted that these respondents did not suggest an appropriate methodology that could be used, with certainty, to show the level of demand prior to a competition.

ComReg does not consider that such a review should be necessary or that it would be helpful in the circumstances. Even if ComReg was to exercise its formal power to obtain information, which it does not consider appropriate or necessary, ComReg notes that this is unlikely to obtain helpful information as, amongst other things, any information obtained might be heavily qualified. This is particularly the case in respect of information of a highly confidential nature, such as business or investment plans which would likely be conditional on a range of different factors such as capital availability at the time of competition, auction rules, reserve price, etc. Further, any such power may, in any event, not be relevant in the case of undertakings outside of the State (which may be seeking to enter the Irish market).

ComReg's previous experience would suggest that there may be legitimate reasons why a potential participant in a competition, whether an incumbent or potential licensee, may choose to not reveal its intentions in acquiring particular spectrum. This applies both in absolute terms and in terms of the amount of spectrum it seeks to acquire and/or the location of that spectrum in the spectrum band. This may be the case where the relevant information is highly confidential and/or where creating uncertainty over the bidder's intentions may form part of its bidding strategy.

For these reasons, ComReg does not consider that it is reasonable or indeed necessary *conclusively* to determine the real level of demand prior to deciding to hold, or holding, any competitive process, as it considers that there is sufficient evidence of demand and reason to believe that a competitive spectrum assignment process would be appropriate in all the circumstances. Where the preponderance of the responses received to date strongly indicates that there is significant excess demand, ComReg is entitled to take such into account in its decision making.

ComReg has reason to believe, on the information currently available, that demand is likely to exceed supply for liberalised 900 MHz spectrum in Ireland and, to ensure further transparency on this issue, sets out a summary of this information below.

First, existing GSM 900 licensees have variously put forward options[28] which have involved them, for a variety of stated reasons, holding at least 10 MHz of 900 MHz spectrum. In this regard, ComReg notes that these licensees have stated that they should retain at least 5 MHz of 900 MHz spectrum with which

[28] See page 4 of Vodafone's response to Consultation 08/57, Pages 19 to 24 of Telefonica O2's response to consultation 08/57 and page 33 of Meteor's response to Consultation 08/57.

to provide continued service to existing GSM customers. In addition, it is clear from their various proposals that there would likely be demand from each of them for at least a further 5 MHz with which to provide 3G services at 900 MHz.

In addition, the other MNO, H3GI, which does not presently have 900 MHz spectrum, has stated its clear interest[29] in acquiring 2 × 10 MHz of spectrum. In addition, ComReg notes this respondent stated its belief that demand would clearly exceed supply when just considering current MNOs in the market. ComReg has no reason to believe why such an expression of interest, from an existing operator in the market, should be discounted given the strategic importance of this spectrum.

These combined responses would appear to indicate demand for at least 2 × 40 MHz of spectrum, when there is only 2 × 35 MHz available.

Further, ComReg notes that a number of non-mobile network operators also expressed an interest[30] in acquiring such spectrum. In addition, it is ComReg's experience that new market entrants do not have good incentives to express their interest before the auction is held, and will often not do so in practice.

ComReg's position on likely spectrum scarcity at 900 MHz is informed, more generally, by the particularly valuable nature of 900 MHz spectrum, being the only sub-1 GHz spectrum available in Ireland with which to deploy mobile voice, text and broadband services. In this regard, ComReg recognises the strategic importance of acquiring rights to this spectrum, and the attendant cost advantages that this spectrum provides over other spectrum (e.g. 1800 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz). Moreover, it is noted that this spectrum is being made available for licence durations of at least 15 years and while any spectrum deriving from analogue television broadcasting switch off (ASO) may become available during the life of new liberalised 900 MHz licences, there remains considerable uncertainty over the quantum, nature and availability of this spectrum – both at an Irish and European level - which, in this context, serves to reinforce the likely significance of obtaining 900 MHz spectrum at this particular time.

Should LTE equipment eventually become approved for use in the 900 MHz band (noting present technical issues surrounding the provision of voice and text services using LTE), the available evidence suggests that such technology would likely require contiguous blocks greater than 2 × 10 MHz in size to function most efficiently and it is likely, in such circumstances, that an operator seeking to deploy such technology would correspondingly be likely to require (notwithstanding the finite supply) in the longer term, but during the life of any liberalised 900 MHz licence, more than 2 × 10 MHz of 900 MHz spectrum.

[29] See redacted minutes of bilateral meeting with H3GI published in ComReg Document 09/73.

[30] See redacted minutes of bilateral meeting with Digiweb, Imagine, UPC published in ComReg Document 09/73.

Furthermore, DotEcon's independent review of consultation responses, bilateral meeting minutes and other material also indicates that demand is likely to exceed supply, noting that in its view "…the main focus of competition is likely to be H3GI pushing for 2 × 10 MHz against the GSM incumbents' reluctance to drop back to 2 × 5 MHz." (Section 8.1 of DotEcon report)

In light of the above, ComReg expects that demand for liberalised 900 MHz spectrum will likely exceed supply and hence will utilise a competitive format when assigning this spectrum.

In addition, ComReg notes that should demand for liberalised 900 MHz spectrum not exceed supply as claimed by certain respondents, for whatever reason, then incumbent licensees seeking to acquire spectrum to service existing GSM customers and to deploy 3G services at 900 MHz would not face *any* risk of not gaining the spectrum they require and, in such circumstances, should have no objection to the principle of participating in a properly designed, transparent and non-discriminatory competitive process. ComReg recognises that should demand not exceed supply in a competitive process, then the process adopted must be capable of taking this possibility into account and ensuring efficient outcomes irrespective of actual demand levels.

Finally, ComReg would note the following reasons, which are *not* related to spectrum scarcity, as to why ComReg considers that an *auction format* is the most appropriate competitive spectrum assignment process in the present case.

As demonstrated in ComReg's 26 GHz spectrum award, the use of a correctly planned auction has great utility even where demand does not exceed supply. In this case, in the first stage of the auction bidders paid the reserve price[31] as demand did not exceed supply and in the second stage allowed market forces to determine the final location of bidders within the band plan (thus minimising the need for administrative assignment/intervention). In holding this two-stage auction, it became apparent that of more importance to bidders was the need to assure their preferred location in the band (which was reflected by the substantial single fixed bids offered in the second stage by bidders in this regard). ComReg notes that this issue is also of relevance in relation to 900 MHz spectrum and this issue is dealt with in Section 12 (and Part B of DotEcon's report).

In addition, ComReg considers that a properly designed auction avoids the significant theoretical and practical difficulties associated with determining appropriate spectrum usage fees by administrative means. ComReg notes that this issue is also of considerable importance in relation to 900 MHz spectrum and this issue is dealt with in detail below.

[31] Of importance in this process was the correct determination of the reserve price in the event that demand did not exceed supply, by which to ensure the optimum use of spectrum and to permit the State to accrue a fair return on the use of a valuable natural resource and an auction process that is efficient irrespective of demand issues.

6.9 Competitive effect of the National Broadband Scheme

A respondent claimed that the National Broadband Scheme (NBS) effectively mitigated the competitive disadvantage associated with not having access to 900 MHz spectrum in a scenario where ComReg decided to liberalise existing licences. This respondent stated:

> *"At the time of the July 2008 consultation no mobile operator, H3G included, had access to an economically viable solution to the provision of rural 3G coverage. We appreciate that the specific circumstances of H3G, with no access to 900MHz spectrum, may have influenced ComReg's thinking in respect of its proposals. However since that consultation H3G has secured the National Broadband Scheme contract (NBS). We understand that H3G's technical NBS solution will predominantly be provided over its 3G mobile network infrastructure. H3G has announced its intention to roll-out sites within 18 months, which we presume will mean that H3G will have achieved national coverage for its 3G network services. H3G could not achieve this economically without the subvention offered by the State through the NBS.*
>
> *H3G now has a solution to the economics of cost effective 3G rural coverage while its mobile competitors do not. Consequently the question as to whether H3G may be disadvantaged in the context of access to 900MHz is no longer a material consideration. Against the backdrop of this major development since the July consultation, there is a real risk that ComReg's policy proposals will restrict the ability of other operators to effectively compete in the provision of mobile broadband services. It should be noted that H3G had a 39% share of mobile broadband subscriptions as at December 2008."*

ComReg's View

In relation to the respondent's comments, ComReg would note the following:

- In December 2008, the Department of Communications, Energy and Natural Resources (DCENR) entered into a contract with H3GI for the delivery of the National Broadband Scheme following a public tender process;
- The total value of the investment required to implement the NBS is circa €223m, of which the Government is contributing €79.8m;
- The rollout of approximately 400 additional 3G sites is envisaged in order to meet the terms of the NBS award. In this regard, ComReg notes that existing GSM networks each contain in the order of three to five times this number of sites, which if liberalised, could be used for the provision of 3G services.

Given the superior propagation characteristics of the 900 MHz band, which provides superior urban indoor and rural coverage, any decision to liberalise

existing 2G licences would clearly have the potential to provide a significant advantage on existing holders of spectrum in that band[32]. Accordingly, ComReg does not concur with the assertion that the award of the NBS mitigates the potential for distortion to competition that would likely be associated with the administrative liberalisation of existing licences.

6.10 Miscellaneous issues

A number of points were also raised by respondents which ComReg does not further consider for the following reasons;

- *Making 900 MHz spectrum available in block sizes of 2 × 10 MHz as opposed to 2 × 5 MHz.*

ComReg notes that this option was considered and addressed in Section 7.4.2 of Consultation 08/57. This respondent did not respond to Consultation 08/57 and in its response to 09/14 it has provided no information not previously considered.

- *Bundling 900 MHz spectrum with GSM-R spectrum (GSM-Rail in the band 876 - 880 MHz paired with 921 - 925 MHz).*

Prior to the publication of Consultation 08/57, ComReg investigated the possibility of using GSM-R spectrum for public cellular use, and to this end conferred with industry players and equipment manufacturers to assess the availability of suitable equipment. Following its enquiries, ComReg concluded that no suitable public cellular equipment was available, including legacy or planned user handsets capable of operating in the GSM-R band. ComReg notes that the current common European allocation for spectrum in the GSM-R band is for railway operations.

- *Bundling 900 MHz spectrum with spectrum between 300 and 500 MHz*

The specific bands concerned were not stipulated by the respondent in question and ComReg notes that there is no currently unassigned spectrum in this range for award.

- *Bundling 900 MHz spectrum with spectrum assigned in other licences.*

The suggestion was put forward that ComReg should revoke usage rights for spectrum assigned in a number of existing licences outside the 900 MHz and 1800 MHz band. ComReg notes that the licensees referred to are compliant with

[32] For example, see Meteor's response to ComReg 08/57 (page 82 of 09/14s) "Given the favourable propagation characteristics of the 900 MHz band, liberalisation will enable licence holders to cover larger distances than is currently possible in the higher frequency bands that are authorised for UMTS. This should be of particular benefit in providing broadband services to customers in rural and less densely populated areas."

their respective licence conditions and rejects any suggestion of licence revocation on this basis.

Following on from the three proposals that seek additional Mobile spectrum allocations, ComReg notes that the spectrum band immediately above the GSM900 band, (960 to 1164 MHz) is allocated internationally to the Aeronautical Radionavigation and Aeronautical Mobile Services.

7 Summary of Options and Proposals for Spectrum Release

This section sets out the views of respondents in relation to further consideration of Options A, B and C (as set out in Consultation 08/57) and Options 1 and 2 (as set out in Consultation 09/14).

Alternative proposals put forward for ComReg's consideration by respondents to Consultations 09/14 and 08/57 are detailed in this section and in Annex F, respectively.

ComReg's analysis of the alternative proposals put forward by respondents is set out in Sections 9 and 10 of this paper.

Figure 1 is presented to assist the reader in identifying references made in the text to current frequency allocations and spectrum blocks.

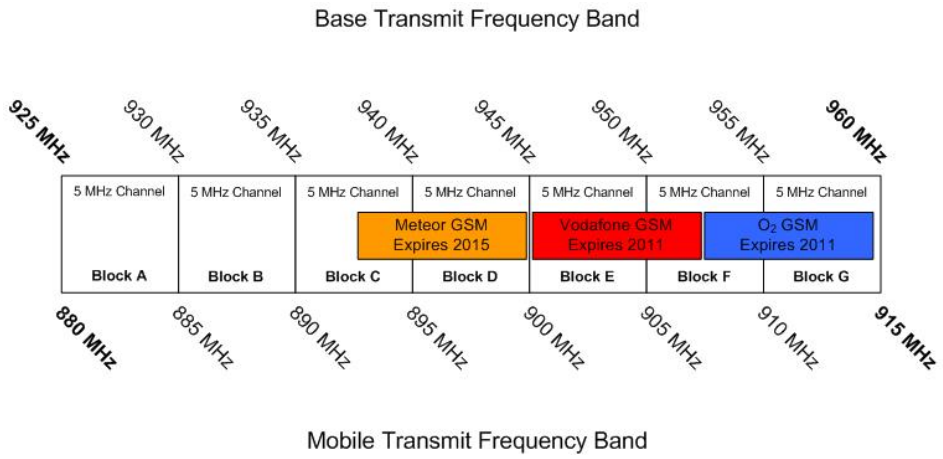

Figure 1 Current frequency assignments and identification of blocks in the 900 MHz band.

7.1 Options A, B and C of 08/57 (Question 5 of Consultation 09/14)

In Section 8 of Consultation 08/57, ComReg set out three possible options for the future licensing of the 900 MHz band.

In Section 8 of Consultation 09/14, ComReg expressed the view that the Options A, B and C should no longer be considered and put forward Question 5 to ascertain the view of interested parties in this regard.

Q.5. of 09/14: Do you believe that the Options for the release of spectrum in the 900 MHz set out in Consultation 08/57 (Options A, B and C) should be further considered by ComReg? If yes, please provide detailed supporting argument with your answer.

7.1.1 Views of Respondents

There were seven responses to this question.

Six respondents opposed further consideration of Options A, B and C and the reasons given were as follows:

- the three options are, in varying measures, inappropriate, unreasonable, disproportionate, unjustified and/or unnecessary and hence contrary to ComReg's regulatory objectives;
- no further consideration was required as they have been discussed; and
- a variant of Option B was proposed in Consultation paper 09/14 (Option 1).

Only one respondent supported further consideration of the three options, but only in circumstances where they were modified to facilitate rural deployment of sub-1 GHz wireless technologies.

7.1.2 ComReg's View

While ComReg accepts that the issue of geographic coverage and service availability is an important factor in relation to potential licence conditions (see later in Section 15 of this paper), it notes that it is important to draw a distinction between issues surrounding potential licence conditions and the principles and mechanics of spectrum award. ComReg does not consider the issue of licence conditions to be relevant to the question of whether or not options A, B and/or C should be further considered.

Having considered the views of all respondents on this issue and, in light of the fact that ComReg's thinking and analysis on spectrum award has developed considerably since it put forward its proposals in Consultation 08/57, ComReg has decided to give no further consideration to Options A, B and C.

7.2 Options 1 and 2 of 09/14 (Question 5 of 09/14)

In Section 9 of Consultation 09/14, ComReg set out two new options for the future licensing of the 900 MHz band, after having given due consideration to the feedback received in relation to its earlier options.

ComReg asked a number of questions regarding Options 1 and 2 and a summary of the responses received to these questions are set out below.

7.2.1 Preference for New Options (Question 6)

ComReg invited views from all interested parties on their preference on the two new Options 1 and 2, along with supporting arguments as follows:

Q.6. of 09/14: Which of the two Options described above for release of spectrum in the 900 MHz band would you prefer? Please provide supporting arguments with your answer.

7.2.2 Views of respondents – general comments

Nine responses were received to this question.

This section first summarises general points made about the two options and then follows with a summary of points particular to the specific options.

Existing GSM Licensees

Existing GSM licensees generally indicated that they were less than satisfied with Options 1 and 2. Two of these respondents acknowledged that at least some of their concerns had been taken into account in the framing of Options 1 and 2, albeit that the two new options did not fully, in their view, address their issues. The third relevant respondent contended that neither of the two options addressed its concerns as each was still predicated on licence expiry and auctioning of the spectrum. Taken collectively, the principal issues raised by existing GSM licensees can be summarised as follows:

- they would still be placed at risk of losing access to 900 MHz spectrum;
- actual loss of 900 MHz spectrum would have severe consequences and the viability of potential mitigating factors set out by ComReg in Consultation 09/14 (such as using alternative spectrum, MVNO and roaming options) was disputed;
- the new proposals did not address these respondents' expectation that their respective GSM licences would be renewed on a "demonstrable needs" basis and ComReg's position, in this regard, had not been adequately explained[33];

[33] The issue of the Director's statement is addressed by ComReg in Section 6.5 of this paper.

- both proposals risked serious long-term disruption to a competitively functioning market and could deter investment through the erosion of regulatory certainty. It was also claimed that neither option took account of the large investments that have been made in the band which, it is argued, were influenced by the ODTR's representation. In addition, it was submitted that any promotion of competition through new market entry exposed incumbents to risk and undermines promotion and protection of efficient investment in infrastructure;

- Alternative suggestions put forward in response to Consultation 08/57 (which were broadly similar in nature) had been disregarded by ComReg;

- European developments and "international best practice" favouring licence renewal had been inappropriately discounted by ComReg. For example, one respondent claimed, albeit without substantiation, that elsewhere in Europe experience demonstrated that the cost to incumbents of losing access to spectrum outweighed the consumer benefit associated with new market entry;

- one respondent also claimed that, in contrast to other existing GSM licensees, it was at a different point in its licence term and its business cycle. It further stated that it had yet to make a positive return on a cumulative basis and would require further investment for years to come if it was to remain competitive. It therefore contended that it would be affected more adversely by the uncertainty associated with an auction than would the other MNOs;

- it was also submitted that the awarding of the National Broadband Scheme contract to Hutchison 3G Ireland and "the associated State subvention" had mitigated the competitive disadvantage associated with H3GI not having access to 900 MHz spectrum;

- these respondents questioned the basis of ComReg's belief that demand for liberalised 900 MHz spectrum would exceed supply and asserted that a review of "real spectrum demand" should be conducted following conclusion of Consultation 09/14. Spectrum scarcity was also claimed to be insufficient justification for an auction of the entire band[34];.

- there is potential for value asymmetry in any proposed auction for the entire band arising from size, location and the timing of availability of lots and the auction mechanism must address this; and

- the auction format will require consultation.

[34] This issue is addressed by ComReg in Section 6.8 of this paper.

In light of the above factors, two existing GSM licensees rejected both options in favour of their own options as previously set out in response to Consultation 08/57. Another respondent also noted the risk for incumbents in not securing 900 MHz spectrum.

MNO not holding GSM Licence

On the other hand, a further respondent challenged the views put forward by incumbent GSM licensees (in response to Consultation 08/57) and submitted the following:

- incumbent GSM licensees were unduly stressing the risk of loss of all 900 MHz spectrum, which, in its view, was an unlikely scenario;

- incumbent GSM licensees had options with which to mitigate the risk of losing any 900 MHz spectrum, such as through roaming and alternative spectrum holdings;

- there was sufficient existing competition to support consumers in the case of an incumbent GSM licensee losing access to 900 MHz spectrum and/or exiting the market. In this regard, it considered that two years of advanced notice would be sufficient for incumbent operators to "transition to other solutions", and two significant recent Irish network replacements (that of O2 and H3GI) were cited in support of this, neither of which it was pointed out lead to much consumer disruption; and

- there was no requirement for protecting incumbent GSM licensees from the loss of spectrum as each could bid on equal terms with other interested parties. In this regard, it argued that, in reality, Vodafone and O2 had failed to properly plan for their business and that spectrum retention would be an unjustified "bailout" on the part of ComReg.

Other Interested Parties

Other respondents to this question variously:

- considered that ComReg had taken on board feedback from all respondents to Consultation 08/57 and had put forward two new proposals that were "significant improvements";

- pointed to the importance of liberalisation in delivering further consumer benefits, but noted that the competition issues raised were better addressed by the mobile operators; and

- argued that both options set out in Consultation 09/14 were "irrelevant" with small spectrum blocks available (i.e. 5 MHz), and considered instead that existing GSM licensees should have their licences extended so as they might invest in their networks, thereby providing better coverage in rural areas.

Views of respondents regarding Option 1

A number of arguments, both for and against Option 1, were raised by respondents and these are summarised below.

Arguments put forward in support of Option 1 included that it:

- would provide visibility and certainty to all players regarding immediate and future availability of 900 MHz spectrum;
- would provide a greater level of regulatory and business certainty than Option 2;
- would promote competition by providing an opportunity for new entrants to obtain liberalised spectrum early;
- would promote the interests of users;
- would be advantageous in terms of the efficient use and effective management of the radio spectrum;
- would provide for a co-ordinated release of all used and unused spectrum in the band; and
- it was an improvement on the options proposed in Consultation 08/57, however undesirable aspects remained, most notably in relation to the risk of existing MNOs failing to acquire 900 MHz spectrum in any auction.

Arguments put forward against Option 1 included that:

- it offered no security for existing licensees which must reacquire spectrum at auction, with the only mitigating factor being the introduction of a 2 × 10 MHz spectrum cap;
- although it provided regulatory certainty for all participants, such certainty could be achieved through licence renewal without the associated risk to incumbents;
- the location of Meteor's existing assignment and its 2015 release date would create difficulties for the other two existing GSM licensees if they were required to relocate after conclusion of a 2009 auction. In this regard, it was submitted that account needed to be taken of the later expiry date of the Meteor licence;
- the option to auction the entire band is "highly prejudicial" at this point in Meteor's business cycle, requiring it to bid on its licence 8 years into a 15 year licence; and

- it is preferable in the view of some respondents to increase incumbent holdings to 2 × 10 MHz through an administrative assignment process, followed by an award of currently unassigned spectrum through an auction mechanism.

Views of respondents regarding Option 2

In the main, Option 2 was not favoured by the majority of respondents, although two respondents saw sufficient merit in the approach, if appropriately amended, for it to form the basis of a solution.

The first of these respondents strongly favoured Option 2, as it would, in its opinion, best facilitate the roll-out of services in rural areas through appropriate licence conditions. ComReg notes that the mechanics of this respondent's suggested approach were less clear but seemed likely to have the effect of unduly distorting the development of the market.

A second respondent, although not supporting Option 2 as it was presented, considered that Option 2 included provisions to minimise the risk of loss of spectrum to existing GSM licensees and disruption to consumer services and could form the basis for a solution which addressed "most of the issues in the band". However, it considered there to be a number of serious shortcomings in the option as presented, including:

- the issue of fees was critical to its viability and not enough detail was provided in this regard;

- bids would be made on two specific lots only, creating an artificial restriction on supply;

- it created a potential for inefficiency as it did not allow all unused and released spectrum to be assigned when available; and

- it would be more likely to result in multiple auctions.

The variations to Option 2 proposed by this respondent are considered later in this document – see Sections 9 and 10 of this document.

A number of arguments were put forward against Option 2 and these are summarised below.

Two existing GSM licensees considered Option 2 to be preferable to Option 1 given the reduced risk of loss of spectrum, but nevertheless maintained that their respective alternative proposals (submitted in response to Question 17 of Consultation 08/57) were superior to Option 2 in terms of promoting the objectives of the 2002 Act. In this regard, these respondents variously raised the following concerns regarding Option 2 as put forward by ComReg:

- the limited duration of the proposed potential licence extension was arbitrarily selected to coincide with the expiry of Meteor's licence

although, in its view, 2G legacy issues were likely to persist beyond 2015;

- the first mover advantage conferred on new entrants, in the case where potential licence extensions were not on a liberalised basis, could reverse any competitive distortion in the market rather than mitigating it. This would, it was argued, also artificially delay the availability of enhanced services to end users and may be contrary to the EC Decision and Amending Directive;

- the proposed multi-stage auction format would lead to uncertainty and curtail the bidding options that would otherwise be open to participants in any particular phase of the process;

- the staggered availability of re-farmed spectrum when taken with the intention to auction the entire band would be "highly prejudicial" to Meteor; and

- insufficient information had been provided for respondents to provide an informed opinion, particularly in regard to the issue of fees associated with Option 2.

Other respondents were also not in favour of Option 2.

One respondent submitted that not only was it inconsistent with ComReg's earlier position on GSM licence expiry and inherently uncertain, but that Option 2 would, in its view, be contrary to European state-aid law in that it would involve conferring a selective economic advantage on the incumbents. This respondent also considered that Option 2 would unnecessarily delay the liberalisation process due to the following:

- the requirement on ComReg to consult on the appropriate methodology for assessing incumbent spectrum retention, and spectrum usage fees associated with this,;

- the time required to assess applications for spectrum retention;

- the possibility of legal challenge to any spectrum retention decision;

- the decision not to grant retention post-2015 may also be open to legal challenge; and

- the requirement (as contended by the respondent) to notify the European Commission of the grant of state aid and corresponding two month stand-still period.

Other respondents, including those potentially interested in acquiring liberalised spectrum, were also generally opposed to Option 2, primarily on grounds of spectrum efficiency. Points raised in this regard include:

- allowing incumbent operators an opportunity to hand back 2 × 2.2 MHz would be inefficient as this opens the possibility of incumbents returning 2 × 2.2 MHz of spectrum and acquiring 2 × 5 MHz of spectrum in block A and B, thereby impeding new entrants; and

- this option carried a greater risk of stranding spectrum blocks.

Views of respondents on the proposed Memorandum of Understanding on realignment of incumbent spectrum holdings

Respondents generally agreed that a coordinated approach to spectrum realignment would be beneficial and supported the principal of a MoU in this regard. Respondents expressed some concerns that, in practice, a MoU might be fraught with difficulty. Some respondents suggested that the issue of spectrum realignment would be better addressed through a two-stage competition process. Points raised in this regard were:

- although the MoU was desirable in principle, for such an agreement to be workable in practice, however, a phase of the award process should assign abstract blocks without associated frequencies;

- the MoU could be problematic in practice, due to issues such as the "architecture, design and modernity" of the 2G networks involved. In this regard it was suggested that realignment could be addressed better by adopting a combinatorial auction format and thus allowing operators to decide the matter by bidding on the location of future holdings; and

- the MoU could constitute an amendment of existing spectrum usage rights and, in this context, must satisfy licensee entitlements in respect of same under the Authorisation Directive/Regulations.

7.2.3 ComReg's View on MoU

ComReg is grateful for the views expressed on this matter. In light of the potential for inefficiencies and uncertainties associated with attempting to administratively determine spectrum realignment, ComReg is now of the view that such issues should, wherever possible, be determined by market mechanisms. ComReg therefore favours addressing this issue in the context of Modified Option 1 (see Section 8.2 of this paper and the relevant sections of the DotEcon Report).

Respondents are therefore referred to the spectrum realignment mechanism in Modified Option 1 and invited to raise any residual issues regarding spectrum realignment that might arise in the context of this Option.

7.3 Increased spectrum usage fees under Option 2

In question 10 of 09/14, ComReg sought to gauge views with regard to the principles outlined for setting increased spectrum usage fees that would be associated with any spectrum retention under Option 2, as follows:

> **Q.10. of 09/14: Under Option 2, and in the event that the existing 900 MHz licensees wish to continue use of their frequency assignments beyond the expiry dates of their current licences, do you agree with the principles ComReg has outlined for use when setting an increased spectrum fees levy appropriate for those extended licences? Please provide supporting arguments with your answer and suggest a detailed alternative if applicable.**

7.3.1 Views of Respondents

Six responses were received to this question.

Of these, only one favoured the ComReg proposal stating, without prejudice to its view that Option 2 would contravene European State Aid law, that if ComReg was to implement this proposal then it should charge an appropriate spectrum access fee and annual spectrum fees.

The remaining respondents raised concerns with ComReg's proposal, with two main issues emerging:

- first, that spectrum usage fees should only be increased if the licences are extended on a liberalised basis, with one respondent in particular arguing that GSM services are provided in the "public interest" and that ComReg's proposal for setting licence fees for extended licences would contravene Article 13 of the Authorisation Directive; and

- the appropriate spectrum usage fee should be set by reference to any spectrum auction held by ComReg in the 900 MHz band and, according to one of these respondents, ComReg must also be conscious of the current economic downturn and its effect on mobile operators.

A number of respondents also raised issues with regard to the methodology to be employed in setting any spectrum usage fees associated with Option 2. One respondent submitted that the lack of detail provided with regard to the methodology to be employed had prohibited respondents from inferring a level for the upfront price and revised annual spectrum usage fees. It also suggested that any spectrum usage fees for any licence extension must be refundable where a retained holding is surrendered in advance of its amended expiry date. Another respondent submitted that a spectrum usage fee structure based on

phased payments throughout the duration of the licence, rather than an upfront fee, would better incentivise operators to release spectrum when it was no longer required for GSM.

Several respondents recognised the difficulty in setting an appropriate fee absent an auction. One such respondent submitted that the issue of fees was best left until the full use of 3G at 900 MHz has been concluded while another expressed a complementary view that any fees must be reasonable and based on market valuation realised at auction. Another respondent submitted that complications associated with determining an appropriate spectrum usage fee level for any incumbent retention of spectrum were significant to the extent that Option 2 would, in its view, be unworkable.

During its bilateral discussions with respondents, ComReg sought to further clarify the positions of respondents regarding the setting of spectrum usage fees and particularly with regard to setting such fees according to the principle of opportunity cost. Three respondents considered that an auction would establish opportunity cost, with one suggesting that any scarcity value arising in an auction would also have to be mitigated. Given that the outcome of an auction would not be known in advance of any extension of renewal, two respondents stated that the price would be best set subsequent to any auction.

Finally, one other respondent expressed the view that any additional fees raised would be simply passed on to the consumer. Spectrum licensing, in its view, should not be a revenue raising activity and in this light it called on ComReg to disclose any “minimum take” set down by the Department of Finance.

7.3.2 ComReg’s view

In Consultation 09/14, ComReg proposed that spectrum usage fees should be based on the opportunity cost of liberalised spectrum to reflect the lost opportunity to society (including consumers and other potential users of spectrum) in terms of delayed liberalisation, irrespective of whether spectrum was awarded by competitive assignment or retained by existing GSM licensees via through an administrative process.

In light of responses received and upon further consideration, ComReg accepts that administratively setting spectrum usage fees for any spectrum retention under Option 2 would be very difficult. In this regard, ComReg is sensitive to the fact that setting spectrum usage fees too high may have a detrimental effect on those existing GSM licensees retaining spectrum and, by extension, their customers, and that setting spectrum usage fees too low may provide an additional advantage to these licensees by enabling them access to spectrum at a lower price than would be the case in a competitive setting. In addition, ComReg notes at present there has yet to be an equivalent open award of liberalised 900 MHz spectrum upon which the market value of such spectrum in Ireland could be reliably estimated.

In relation to the view expressed by one respondent that existing GSM licensees should not be "penalised" for continuing to provide GSM services, ComReg would point out that the determination of spectrum usage fees is not intended to deter GSM provision, but rather ensure the efficient use of spectrum. In this regard, ComReg also notes one respondent's view of the importance of setting spectrum usage fees so as to incentivise the release of any spectrum which is being inefficiently used, and has taken this view on board in its proposals on Licence Fees in Section 13.

ComReg rejects any suggestion of external or undue interference in its responsibilities as an independent regulator. Licence fees are set by reference to ComReg's statutory spectrum management responsibilities.

7.4 Alternative proposals put forward by respondents

In Consultation 09/14, ComReg invited views on variations to existing proposals or altogether new proposals that ComReg should consider in finalising the process, along with supporting arguments and detailed alternatives. The proposals put forward by respondents are summarised in this section and analysed in more detail in Sections 9 and 10.

In Consultation 08/57, ComReg also sought alternative proposals for the future award of spectrum. The proposals received are also assessed in Sections 9 and 10 and a summary of each proposal is provided in Annex F.

7.5 Variations of Options 1 & 2 (Question 7)

In Question 7 of 09/14, ComReg sought views on what variations of the two Options it should consider in finalising the process.

7.5.1 Views of Respondents

Eight responses were received. Four respondents considered that no variation was required as:

- only Option 1 in its current form was acceptable; and
- both Options 1 and 2 were either irrelevant or inferior to alternative proposals submitted in response to Consultation 08/57.

Nevertheless, one of these respondents suggested that Option 2 might be improved by liberalising any spectrum retained beyond the 2011 licence expiry and by ComReg fully elaborating any methodologies for spectrum usage fee determination.

7.5.1.1 Proposed Variations of Option 1

Three respondents proposed variations of Option 1 which included:

UPC's proposed Option 1 variant

UPC suggested that:

- blocks A and B be reserved for one new mobile entrant;
- a "beauty contest" would be preferable; and
- licence fees should reflect the fact that a new entrant would have greater start-up costs.

UPC justified its proposal on the basis that:

- a new mobile entrant must be able to compete with established operators who did not have to acquire their current assignments at auction;
- incumbents would not be adversely affected should a new entrant acquire 2 × 10 MHz of spectrum in the 900 MHz band, as incumbents are less dependent on 900 MHz spectrum due to their "dense networks" and additional holdings in the 1800 MHz and 2100 MHz bands;
- incumbents already have a strong customer base and have recovered costs on initial network investment; and
- it would be difficult for the market to support two new mobile entrants, given the trend towards consolidation in other European countries.

Digiweb's proposed Option 1 variant

Digiweb suggested that at least one 2 × 5 MHz block (either Block A or B) be made available to new entrants on the basis that:

- it would allow a new entrant speedy access to a 2 × 5 MHz block of liberalised spectrum; and
- it would promote competition by allowing new entrants the greatest opportunity to acquire spectrum in the band.

7.5.1.2 Proposed variations of Option 2

Telefonica O2's proposed Option 2 variant

O2 submitted that Option 2 could be suitable with the following variations:

- the decision concerning spectrum retention must be concluded ahead of the auction, so that all unassigned and released spectrum could be

included in the first auction (including blocks C1 and any spectrum released by existing operators before the auction); and

- participation of incumbents should not be restricted other than the 2 × 10 MHz spectrum cap;
- fees for any spectrum retention should be reasonable and based on annual payments which would better incentivise spectrum release than an upfront lump payment;
- retuning would be necessary to allow for aggregation;
- any auction process must be properly designed for efficient spectrum assignment; and
- there is no state-aid issue if a fair price is charged.

O2 did not offer any detailed opinion on how fees should be set, other than to encourage dialogue between ComReg, O2 and possibly Vodafone. O2 did suggest that fees for retention should reflect current market conditions and cited falling ARPU and increasing traffic.

O2 considered that its proposal was viable as it provided incumbent GSM licensees with the necessary protection (against loss of spectrum), allowed all interested parties an equal opportunity to obtain liberalised spectrum, maximised efficiency through the early assignment of unused spectrum, and minimised the number of auctions that would be required.

O2 also listed a number of desirable outcomes from the process in order of priority:

- primary objective: to create security for existing operators; and
- of secondary nature:
  - maximise spectrum quantity released in each auction phase;
  - permit retuning to aggregate spectrum assignments;
  - equal opportunity for existing operators to access liberalised spectrum; and
  - fees set to promote efficiency; not to maximise revenue.

7.6 New Options to Consider (Question 8)

In question 8 of 09/14 ComReg invited views regarding any other new options that it should consider.

7.6.1 Views of respondents

Six responses were received to Question 8.

Three respondents reiterated their respective preferred options as set out intheir in their responses to Consultation 08/57. In general, each of these proposals involved:

- some form of renewal or extension of existing GSM licences (generally until the expiry of 3G licences);
- administrative allocation of additional spectrum in two cases; and
- limiting the amount of spectrum available for any competitive award process to a single 2 × 5 MHz block.

Vodafone's alternative proposal in response to 08/57

Vodafone also put forward a further alternative option to that made in its response to Consultation 08/57, as follows:

- extension of term of existing licences until at least 2021, or preferably, to make them of indefinite term with provision for revocation thereafter on five years' notice;
- prompt liberalisation of 900 MHz and 1800 MHz bands in their entirety, including incumbent assignments (as extended);
- advanced publication of a detailed methodology for determination of upfront retention and on-going spectrum access fees with the former ideally based on the value to be realised in subsequent auction; and
- a two-stage auction of unassigned 900 MHz spectrum, in which incumbents could participate within the constraints of the 2 × 10 MHz spectrum cap.
- spectrum assigned via auction to be awarded in non frequency specific blocks of 2 × 200 kHz which could be through package bids;
- 2 × 10 MHz spectrum aggregation cap, but no other impediment on any auction participants;
- the signing of a MoU on incumbent spectrum re-alignment to be a prerequisite of licence renewal;
- upfront fees and on-going access fees to be published in advance of any auction and to be based around market value realised at auction;
- a period for re-alignment of incumbent spectrum holdings to permit aggregation.

Vodafone supported its proposal on the following grounds:

- ComReg's assertion of excess spectrum demand, as a fundamental justification for the auctioning of the band, is disputed on the basis that the demand expressed so far was aired without obligation on the part of proponents to participate in any resulting auction;

- the proposal provides regulatory certainty and allows the incumbents to plan and invest efficiently for the long term;

- the proposal would avoid disruption to existing operators and their customers;

- this option ensures efficient management and use radio spectrum by allowing maximum flexibility to existing and new licensees; and

- the proposal would facilitate a new entrant acquiring 2 × 5 MHz of spectrum.

Vodafone's further alternative as in 09/73

Vodafone also put forward a further alternative option in ComReg 09/73 as follows:

- At the outset (i.e. 2009):
  - All spectrum in the 900 MHz band would be liberalised so as to permit the deployment of UMTS technologies;
  - 2 × 5 MHz of currently unallocated spectrum would be assigned to a new entrant by way of an auction;
  - All existing licensees would sign a binding MOU consenting to retuning / refarming as necessary to ensure contiguous spectrum holdings going forward;
  - Existing licensees would receive a rollover of their licences in respect of 2 × 5 MHz of their current holding for a minimum 15 years;
  - Existing licensees would also be allocated a further 2 × 2.8 MHz, contiguous with their current assignment. This, together with the remaining 2 × 2.2 MHz of their current holding of 2 × 7.2 MHz would be held by these licensees until mid 2015 in order to co-terminate with Meteor's licence;
  - Access fees for the proposed spectrum extensions would be determined by a transparent methodology, defined prior to the auction for unallocated spectrum. The data from this auction would be the key input for the determining the usage fees to be paid in respect of the extensions;
- In 2013, ComReg would stage a competitive award process and would simultaneously auction:
  - all 1800 MHz spectrum (both currently assigned and unassigned) and;
  - all spectrum becoming available as part of the Digital Dividend (Digital Dividend subject to a 2 × 10 MHz spectrum cap).
- Following the auction, spectrum re-alignment would take place so as to ensure contiguous holdings but in a fashion designed to minimise disruption for licensees.

Vodafone supported its proposal on the following grounds:

- It promotes ComReg's regulatory objectives under the 2002 Act and other public policy criteria;
- It ensures a necessary level of regulatory certainty;
- It provides business certainty and enables existing 900 MHz licensees to plan and invest for the long term;
- It avoids the serious risk of disruption and the substantial costs for operators and end users that Vodafone described in its response to Document 08/57 and its Regulatory Impact Assessment submission ;
- The assignment of 2 × 10 MHz of liberalised spectrum to existing licensees would facilitate a timely and efficient migration to enhanced services and more ubiquitous broadband coverage, driven by consumer demand;
- The extension of incumbent spectrum holdings up to 2015 would coincide with the release of additional spectrum in the 1800 MHz band and the "digital dividend";
- It would increase competition on the basis that a new entrant would have immediate access to liberalised spectrum, with the possibility of accessing additional liberalised spectrum in 2015; and
- Operators would be incentivised to maximise value and deliver enhanced services as existing licensees' assignments would be liberalised and priced accordingly.

Respondent's View[35]

Following publication of Vodafone's further alternative in document 09/73, views were received from one respondent, H3GI.

H3GI argues that this latest Vodafone proposal is anti-competitive and, in its view, an attempt to pre-determine the future shape of Irelands retail mobile communications market. Further, H3GI contends that, if adopted, this proposal would prevent it from acquiring 2 × 10 MHz of 900 MHz spectrum until 2015 and that it is illegal and contrary to section 12 of the Communications Regulation Act 2002, regulation 23 of the European Communities (Electronic Communication Networks and Services) (Framework) Regulation 2003, as amended, European Community State Aid law and ComReg's stated position in previous documents on this matter.

In concert with all proposals put forward during this process, ComReg gives this proposal full consideration in Sections 9 and 10 of this document.

Meteor's alternative proposal

Meteor's proposal in response to Consultation 09/14 was identical to that which it put forward in its response to Consultation 08/57, being:

[35] The H3GI letter of 8 October 2009, which details its views on Vodafone's further alternative is published in conjunction with this paper in document 09/99s.

- the administrative assignment of additional 900 MHz spectrum to bring incumbent assignments up to 2 × 10 MHz of liberalised spectrum, and that includes as far as possible their current assignments;

- administrative assignment or auctioning of the remaining 2 × 5 MHz of unassigned spectrum to a new entrant; and

- as demand for GSM services dwindle incumbents would, albeit over an unspecified time period, release blocks of 2 × 5 MHz each for reassignment via auction.

Meteor supported its proposal on the following grounds:

- it minimises regulatory uncertainty;

- it promotes continuity of 2G service provision;

- it facilitates the deployment of technology which would make the most efficient use of spectrum;

- it provides each of the current four MNOs with an opportunity to acquire 2 × 5 MHz of 900 MHz spectrum for 3G services;

- it allows for an immediate release of currently unassigned spectrum and the gradual release of additional spectrum over time; and

- it supports new entry in the 900 MHz band with the need to assure existing operators of the availability of 2 × 10 MHz of the 900 MHz band to reduce costs and minimise customer disruption during the transition from 2G to 3G.

Ericsson's alternative proposal

Ericsson's proposal in response to Consultation 09/14 was identical to that which it put forward in its response to Consultation 08/57, being:

- reserve a 2 × 5 MHz block of liberalised 900 MHz spectrum for each existing GSM operator; and
- auction the remaining 4 blocks in a single combinatorial auction (in 2009).

Ericsson supported its proposal in its previous response on the following grounds:

- it would protect consumers from service disruption;
- it would encourage existing licensees to invest; and
- four 2 × 5 MHz blocks would be available for existing and new operators to acquire at auction.

Ireland Offline's alternative proposals

Ireland Offline put forward four proposals in response to 09/14 as follows:

- hold one auction for all 900 MHz spectrum and GSM-R and Digiweb's WDMDS spectrum;
- pair all 900 MHz spectrum (i.e. GSM and GSM-R and WDMDS spectrum) with 750 – 862 MHz spectrum and auction, with one block reserved for Fixed Wireless only;
- pair all 900 MHz spectrum (i.e. GSM and GSM-R and WDMDS spectrum) with 1800 MHz spectrum and auction, with one block reserved for Fixed Wireless only; and
- add 900 MHz spectrum (i.e. GSM and GSM-R and WDMDS spectrum) to Digital Dividend spectrum and pair with spectrum in the 300 – 500 MHz band, and auction.

Ireland Offline advocated its fourth proposal in particular on the basis that it would combine all bands and a more "holistic approach" could be achieved, thereby bridging the digital divide between urban and rural locations.

Actions suggested by other respondents

Other respondents variously called upon ComReg to:

- carry out a review to establish the "real demand" for spectrum in both the 900 and 1800 MHz bands before adopting any particular approach; and
- apply technology neutrality to future and existing licences and let operators offer whatever services suit their business model.

7.6.2 ComReg's View

ComReg welcomes the views expressed by all respondents, in relation to its proposals as set out in Consultation 09/14, and also alternative proposals put forward.

ComReg's economic advisors, DotEcon, in arriving at its proposals, as summarised in the following section of this document and set out in detail in its report which accompanies this document, have taken account of these views.

Notwithstanding, ComReg has separately undertaken analysis of the relevant options and views expressed in the context of its draft RIA in Section 9 and in light of its statutory objectives, as set out in Section 10.

8 Revised Option for Liberalisation of Spectrum in the 900 MHz band

Throughout this process, ComReg has been seeking to determine how best to liberalise and make available spectrum in the 900 MHz band in line with developments which have now been formalised in the Amending Directive and the EC Decision, and also how best to do so in light of relevant considerations, its statutory powers, duties and functions, and in light of the objectives it is to seek to achieve in exercising its functions by taking particular measures.

ComReg has, with the benefit of its prior consultations and responses to them, identified a number of challenges in this process which need to be addressed. Principally, these are:

- the expiry of existing GSM 900 MHz licences;
- asymmetries in mobile spectrum holdings between existing mobile operators. In particular, three mobile operators (Vodafone, O2, and Meteor) each make use of 900 MHz, 1800 MHz and 2100 MHz spectrum whereas the fourth operator, H3GI, uses 2100 MHz spectrum only;
- likely spectrum scarcity in relation to liberalised 900 MHz spectrum;
- asymmetry in relation to GSM 900 MHz licence expiry as two of these licences, held by Vodafone and O2, expire in 2011 and the third, held by Meteor, expires in 2015;
- liberalising the entire 900 MHz band as soon as possible to ensure the full benefits associated with liberalisation are realised and passed onto users, without creating distortions to competition; and
- how to allow existing and future licensees to effectively and efficiently determine their location in the band including by facilitating access to contiguous blocks.

In light of these asymmetries and challenges, it is not surprising that respondents have continued to put forward disparate views and proposals which therefore do not lend themselves to ready reconciliation.

At a high level, one approach to addressing these challenges would be to do so using administrative measures and processes. In this regard, ComReg's Option 2 envisaged certain administrative measures (such as potential administrative assignment of spectrum to Vodafone and O2 so as to minimise potential disruption to GSM consumer services, a process by which such spectrum would be returned in line with consumer migration to 3G services, and a potential MoU between existing and future licensees to address spectrum realignment). However, with such an administrative approach comes the risk that, however well-intentioned, the measures adopted might not deliver the efficient outcomes sought or even that the measures themselves lead to contentious outcomes. These points were raised by some respondents to Consultation 09/14. Such a situation could add considerable uncertainty to the whole process and delay the

benefits of liberalisation as envisaged in the Amending EU Directive and EC Decision.

In light of the above, and having due regard to the views expressed by respondents in relation to these matters, ComReg engaged expert advisors, DotEcon, to independently design a process that would deal with the above issues using market mechanisms, wherever possible. The terms of reference for DotEcon are contained in the tender document[36] and the report produced by DotEcon, which has informed ComReg's consideration of appropriate processes, has been published in conjunction with this Response to Consultation.

In undertaking this work DotEcon has been mindful of ComReg's publicly stated position on a number of issues:

1. Any existing 900 MHz GSM licence and any spectrum retained to address GSM legacy issues would not be liberalised, while all new licences in the 900 MHz band would be issued on a liberalised basis[37].
2. The restriction on the amount of spectrum in the 900 MHz band that could be held by any licensee to 2 × 10 MHz. For the avoidance of doubt, this cap would apply across all spectrum licences in the 900 MHz band, that is to existing, legacy (if any) and new liberalised licences[38].
3. The award of any future 900 MHz spectrum in a minimum block size of 2 × 5 MHz[39].
4. The holding of a competitive award process for assignment of 1800 MHz frequencies closer to 2013 would provide greater clarity to applicants on spectrum developments in other bands of interest for wideband data transmission, namely the 2.6 GHz band and Digital Dividend spectrum[40].

8.1 Issues with Options 1 and 2

As part of its analysis, DotEcon reviewed the two most recent options (Options 1 and 2) proposed by ComReg in Consultation 09/14 and identified the following issues with regard to the current proposals.

[36] ComReg Document 09/40, Invitation to Tender: Spectrum Liberalisation in the 900MHz and 1800MHz Bands - Economic Advice.

[37] See Section 5.1. of ComReg document 09/14

[38] See Section 6.2.1. of ComReg document 09/14

[39] See Section 6.2.2 of ComReg document 09/14

[40] See Section 6.4. of ComReg document 09/14

8.1.1 Frequency realignments would be dependent on negotiation, rather than using an explicit market mechanism

Options 1 and 2 provide for multilateral post-auction negotiations aimed at re-assigning frequencies among new licence winners and existing 2G licence holders in order to achieve a spectrally efficient final assignment. This re-alignment process would involve at least one existing operator having to move to alternative frequencies within the band. An efficient realignment would involve maximising contiguity, minimising spectrum required as guard blocks between spectrum used for 2G and 3G services and minimising disruption to existing 2G services, or at least achieving a balance between these three goals. Such a process of re-alignment of frequencies may involve the incurrence of costs by those operators that will be required to move within the band. Therefore, it is reasonable to assume that operators would choose to opt out of moving within the band where possible. It is, therefore, highly likely that the realignment of frequencies may be difficult to coordinate and may lead to delay, poor outcomes or even legal challenges.

8.1.2 Administrative allocation of rolled-over spectrum to incumbents would be problematic for pricing efficiently and fairly

DotEcon identified the following four key difficulties with this approach as contained in ComReg's Option 2:

- it might be seen as inconsistent with the position adopted by ComReg on the issue of licence extensions articulated elsewhere in its consultation. Under the proposal, provided Vodafone and O2 can demonstrate a "need" for continued access to spectrum in the 900 MHz band, they would be offered it on terms proposed by ComReg, and only should they decline would the spectrum become available to other candidates. This would equate to a right of first refusal which prioritises the spectrum demand of two operators over that of other potential users;
- it is open to argument that such a process would not be transparent, particularly since all or part of the operators' submissions would be treated confidentially so as to avoid disclosure of business-sensitive information;
- it might be difficult to quantify the need for continued availability of 2G spectrum, the moving costs associated with migrating consumers to alternative frequency bands such as 1800 MHz, and the opportunity cost of the spectrum during the period in which it is retained for 2G use; and
- more importantly, there appears to be a conceptual inconsistency between charging the full opportunity cost of the spectrum and "safeguarding" access to the spectrum for continued 2G use. If the charge is set appropriately, and thus fully reflects the maximum value of the spectrum to an alternative user, then the proposed solution should not in fact provide any additional guarantee, relative to an auction-based assignment, that the incumbent 2G operators would

retain the spectrum. Thus, relative to an auction-based outcome, the only situation in which the provision for 2G licence extensions set out under Option 2 can safeguard the continued availability of spectrum for 2G use is if the administrative price charged to the incumbents is lower than the opportunity cost of the spectrum. By the same logic, any measure to provide additional security of access to 2G spectrum for the current licensees relative to an auction could potentially be viewed as discriminatory in the sense of offering them access to the spectrum at a price lower than which an outside bidder would be prepared to pay.

8.1.3 No mechanism for liberalisation of spectrum prior to expiry of existing licences

ComReg has not adopted a policy of liberalising existing licences due to the potential distortions to competition that this may create in the absence of a competitive award process (see Section 5.1.3 of Consultation 09/14). Prudent economic practice and efficient spectrum management requires that spectrum should be put to its most valuable use; thus, it would be desirable for spectrum that is currently restricted to 2G use until 2015 to be released for a more valuable use such as mobile broadband or a combination of mobile broadband and 2G. As identified by DotEcon, an option potentially exists for Meteor, should it wish, to effectively upgrade its licence at the economically appropriate price and this could be achieved in an efficient, transparent and non-discriminatory manner within the auction. A key advantage of this proposal is that it would free up the 2 × 2.8 MHz of unused spectrum within Block C for productive use earlier than 2015. In addition, should Meteor avail of this option, it would obviate any requirement to move Meteor's current assignment down by 200 kHz.

8.1.4 Sequential auctions (Option 2) would be likely to produce inefficient outcomes

If a sequential auction was to be used, bidders would be unable to switch between licences with different start dates according to their relative value if such licences were offered through different award processes. This would be particularly disadvantageous to any entrant, as they cannot bid across all the available options in a single auction. Sequential auctions also limit the aggregation possibilities, for instance by a bidder winning one block starting from one date and a second block starting at a different date.

On the basis of DotEcon's analysis, full details of which are set out in its report, DotEcon has put forward a new proposal for an auction format, which is akin to ComReg's Option 1.

In ComReg's view, the proposal put forward by DotEcon would appear to effectively and efficiently address four key challenges:

- managing the transition from 2G to 3G technologies within the framework of liberalised licences;

- providing an opportunity for early liberalisation of the spectrum currently not available until 2015;
- facilitating the necessary re-alignment of frequency assignments in the 900 MHz band following the licence award process; and
- achieving co-termination of future licences issued in this band.

The following discussion summarises the DotEcon proposals. It is not intended to be exhaustive and, in this regard, ComReg strongly recommends that all stakeholders take the time to carefully examine the entirety of DotEcon's report, published in conjunction with this paper, to inform themselves of DotEcon's analysis, methodology, assumptions and recommendations.

8.2 Modified Option 1[41]

In ComReg's view, the analysis provided by DotEcon has facilitated the identification of an Option 1 variant ("Modified Option 1"). Modified Option 1 would involve making as much as possible of the entire 900 MHz band available in a single auction.

In the case of this licence award process both substitution and complementarity are important. The use of a simultaneous award process would provide bidders with the flexibility to switch between lots with different start dates based on their requirements. The role of complementarities in this award process will depend on how spectrum is packaged. If spectrum is offered in time-related blocks, e.g. 2011-2015 and then 2015 onwards, there is a clear need for some bidders to want to aggregate the earlier and later lots. A further issue is that two 2 × 5 MHz blocks, and particularly contiguous blocks, are likely to be worth more than double a single block, exposing bidders wanting two blocks to aggregation risks.

Simultaneously auctioning all lots would also mitigate aggregation risks for bidders who may attempt to acquire contiguous lots with different start dates. Furthermore, using a combinatorial auction format with one single auction eliminates all the various sources of aggregation and substitution risk.

Under Modified Option 1, the key steps in the process would be as follows:

i) During 2010 the spectrum in the 900 MHz band would be made available, in blocks of 2 × 5 MHz, in a single licence competition. It is possible that the entire band can be liberalised, if as per point (v) below, Meteor was to avail of the opportunity for early liberalisation. In this option at least twelve lots (5 blocks of 2 × 5 MHz for the period 2011 to 2015, and 7 blocks of 2 × 5 MHz post-2015) or all 14 lots (if Meteor opts for early liberalisation and releases 2 × 7.2 MHz (effectively making available 2 × 10 MHz) in the 2011 to 2015 period) are made available simultaneously in one auction in 2010;

[41] For detail on Modified Option 1 please see Part B of the DotEcon report.

ii) No applicant would be permitted to obtain more than 2 × 10 MHz of spectrum in line with the proposed spectrum cap[42]. In the case of Meteor, whose current GSM licence expires in 2015, the spectrum cap would include current assignments;

iii) A two-stage process would be used for the assignment of specific frequencies. In the first stage (the so-called Main Stage), bidders would bid for a number of generic 2 × 5 MHz lots. Having won a certain number of these generic lots (maximum of two lots in accordance with the spectrum cap), the second stage (the Assignment Stage) would determine, on the basis of bids submitted, the location of spectrum in the band to be assigned to winners. Winners would then be chosen to maximise the total value of winning bids, subject to not awarding more lots than the number of lots available and maintaining the spectrum cap;

iv) All lots would be divided into "temporal lots" as outlined at (i) above. In this approach at least 12 lots would be made available at auction as illustrated in the table below (where the shaded entries indicates the 12 lots that would definitely be made available in 2010).

2011 - 2015	2015 - 2030
A1	A2
B1	B2
C1	C2
D1	D2
E1	E2
F1	F2
G1	G2

Table 3 Temporal Lots

This options deals effectively with different licence expiry dates and locks in frequency assignments in 2011 so that no administrative frequency realignment in 2015 is necessary;

v) A further extension of step (iv) is to allow the spectrum associated with Meteor's existing licence, currently covering part of blocks C1 and all of D1, to be made available on a liberalised basis from 2011 (i.e. before the scheduled licence expiry in 2015). In summary, to achieve this, a package bid would be augmented to include the possibility of releasing existing spectrum as well as buying lots. The spectrum cap would determine the validity of such a package bid, in that it would be necessary for Meteor to give up a sufficient amount of spectrum in order for bids for liberalised spectrum to be accepted. If Meteor were to bid for only one lot in the 2011-2015 category, it may nominate which of block C or D it would give up. In the event that such a package bid

[42] In order to ensure a robust process in the event that demand does not exceed supply ComReg is minded to relax the auction spectrum cap and accept bids up to 2 × 15 MHz.

wins, it is proposed that Meteor would be provided with a "rebate" on its winning price equal to an amount for the residual unexpired term of its licence in respect of blocks C and D. The value of the rebate in euro would be determined by ComReg and announced publicly prior to the auction. For the avoidance of doubt, bids by Meteor including the release of existing spectrum in the 2011-2015 category would be considered to be *gross* of any rebate and its winning price will first be calculated on the same basis as other bidders before any rebate is applied. In the event that any bid by Meteor involving the early release of spectrum is unsuccessful, then the spectrum would remain with Meteor on an un-liberalised basis for the remaining term of its licence. That is, Meteor would retain its existing spectrum rights for use in accordance with its licence conditions if its bid(s) including the release of spectrum are not successful. By matching any spectrum released by Meteor to spectrum acquired by Meteor, the auction should endeavour to address Meteor's concerns, without altering the amount of spectrum available to other potential bidders in the auction. This element of the auction format is discussed in detail in Section 12.2.4.

vi) Prices for winners in each stage would be determined using a second price rule (as used in ComReg's auction of spectrum in the 26 GHz band in December 2007[43]), which would provide reasonable incentives for bidders to bid at or close to their true values for the packages of lots. The auction price for each bidder will be the sum of the base price associated with the number of lots in each category allocated to them plus any additional prices associated with the specific frequency ranges assigned to them based on their assignment stage bids.

It is the view of DotEcon that the issues identified by ComReg earlier I this Section can be addressed by market mechanisms through an auction and in a manner entirely consistent with ComReg's objectives. For these reasons, DotEcon have recommended that ComReg should undertake a simultaneous award process, including all available 900 MHz spectrum lots.

[43] See ComReg Document 07/93R, Information Memorandum - The Award of National Block Point-to-Point and Point to Multipoint Assignments in the 26 GHz band

9 Draft Regulatory Impact Assessment (RIA) on Options and Respondents Proposals for Liberalising and Licensing the 900 MHz Band

9.1 Introduction

This section sets out ComReg's draft RIA, prepared in accordance with ComReg's RIA Guidelines (as set out in ComReg Document 07/56a[44]) ("ComReg Guidelines") and having regard to the RIA Guidelines issued by the Department of An Taoiseach in June 2009 ("the Department's RIA Guidelines"), and the Policy Directions issued to ComReg by the then Minister for Communications, Marine and Natural Resources under Section 13 of the 2002 Act on 21 February 2003 (the "Policy Directions").

According to the Department's RIA Guidelines, a RIA is a tool used for the structured exploration of different options to address particular policy issues. It is used where one or more of these options is new regulation or a regulatory change and facilitates the active consideration of alternatives to regulation or lighter forms of regulation. It involves:

- analysis to ascertain whether or not different options, including regulatory ones, would have the desired impact;
- identifying any possible side effects or hidden costs associated with regulation;
- quantifying the likely costs of compliance on the individual citizen or business; and
- clarifying the costs of enforcement for the State.

ComReg issued guidelines on its approach to RIAs in August 2007. ComReg's RIA Guidelines set out, amongst other things, the circumstances in which ComReg considers that the conduct of a RIA would be appropriate. In summary, ComReg indicated it would conduct a RIA in any process that may result in the imposition of a regulatory obligation (or the amendment of an existing regulatory obligation to a significant degree); or which may otherwise significantly impact on any relevant market or on any stakeholders or consumers.

Whilst ComReg requires to consult in relation to certain matters, and is doing so by means of this document and the documents and processes that have preceded it, there is no strict obligation on ComReg to conduct a RIA in relation to particular aspects. Nevertheless, ComReg has done so in relation to this project as a whole, in the interests of continuing to ensure transparency of its processes and as the outcomes of this project may significantly impact on the telecommunications sector in Ireland, particularly in the areas of mobile services and mobile broadband.

[44] ComReg 07/56a – Guidelines on ComReg's approach to Regulatory Impact Assessment – August 2007.

As set out in ComReg's RIA Guidelines, there are five steps to this draft RIA. These steps are

- Step 1: Identify the policy issue and identify the objectives;
- Step 2: Identify and describe the regulatory options;
- Step 3: Determine the impacts on stakeholders;
- Step 4: Determine the impacts on competition; and
- Step 5: Assess the impacts and choose the best option.

Each of these steps is considered in turn below.

9.1.1 Policy issues to be addressed and associated objectives

Policy issues

The two primary policy issues in relation to the liberalising and making available of spectrum in the 900 MHz band are:

- how best to address upcoming GSM 900 MHz licence expiry and make available the spectrum associated with these licences and the 2 × 12.8 MHz that is currently unallocated (blocks A, B and C1); and
- how best to respect the requirements of the Amending Directive and EC Decision.

Objectives

Section 3.2 of Consultation 08/57 set out a summary of ComReg's statutory functions and objectives in relation to Ireland's radio frequency spectrum. In addition, Section 8 of that paper identified certain additional relevant factors, which flow from those objectives, in the context of the current project. These functions and objectives and the degree to which these may be met under each of the different options, are discussed in more detail in the following Section 10.

The focus of the RIA is, as noted above, to identify the impact of the proposed measure on stakeholders, and on competition. However, there is a natural overlap here with the achievement of ComReg's statutory objectives, in particular in relation to the promotion of competition, which includes as 'sub-criteria', amongst other things, ensuring that there is no distortion or restriction of competition in the electronic communications sector[45], ensuring that users derive maximum benefit in terms of choice, price and quality[46] and encouraging efficient investment in infrastructure and promoting innovation. Accordingly, the impact on stakeholders and on competition is considered in the RIA in the context, and against the backdrop, of these objectives.

[45] Section 12(2)(ii) of the Communications Regulation Act, 2002.

[46] Section 12(2)(iv) of the Communications Regulation Act, 2002.

Pursuant to Section 13 of the 2002 Act, ComReg is also required to comply with the Policy Directions which have been taken into account in the following RIA analysis to the extent that they are relevant to the impact on stakeholders and competition.

9.1.2 Regulatory Options

This section sets out each of the options variously put forward during the course of this project and identifies those to which the Draft RIA relates.

First, ComReg proposed Options A, B and C in Consultation 08/57. No party expressed continued support for any of these options. For the reasons set out in Section 7.1 ComReg has decided not to consider these options further and thus they will not form part of this Draft RIA.

Second, a number of alternative proposals have been put forward by respondents in response to Consultation 08/57. A summary of these are set out in Annex F.

Third, after taking into account respondents' views in response to Consultation 08/57, ComReg proposed alternative Options 1 and 2 in Consultation 09/14. Given the disparity of viewpoints expressed in response to Consultation 08/57, each of these further options was designed to address issues raised in the context of ComReg's objectives.

In response to Consultation 09/14, ComReg received further alternative proposals from respondents. Each of the three existing GSM licensees put forward additional proposals: O2 put forward a modified form Option 2 (which is analysed alongside ComReg's original Option 2); while Meteor and Vodafone's proposals are very similar and thus considered together. Alternative proposals were also made by other respondents to Consultation 09/14 (UPC, Ericsson, Digiweb, Ireland Offline). Digiweb's alternative proposal essentially involves reserving at least one 5 MHz block for a new entrant. As the imposition of a spectrum cap would have this effect, it is considered unnecessary to evaluate this as a unique proposal within the RIA.

While Ireland Offline put forward a number of proposals for consideration, it particularly advocated its fourth proposal, which would involve delaying the auctioning of 900 MHz spectrum until digital dividend spectrum became available at which point there would be a combined auction of 900 MHz, digital dividend spectrum (paired with 300 - 500 MHz spectrum) and certain other spectrum. As there is no definite timetable for the release of digital dividend spectrum, given the present uncertainty surrounding the timing of Analogue Switch Off (ASO), the delay of the award of currently unallocated spectrum (2×12.2 MHz) and spectrum associated with the two GSM licences due to expire in mid-2011 to some uncertain point in the future, would, in ComReg's view, fail to meet the policy of ensuring that liberalisation of the band occurs as early as possible (and could also result in non-compliance with the Amending Directive and EC Decision). Consequently, Ireland Offline's proposals are not

considered further in the Draft RIA. In addition, Vodafone's proposal in 09/73 referred to the release and auctioning of Digital Dividend and other spectrum. For the same reasons, this aspect of Vodafone's proposal has not being considered in the draft RIA.

ComReg, working with its economic consultants, DotEcon, has taken account of some of the key elements of the revised options as proposed by respondents, in particular measures to ensure the early liberalisation of the band and the provision of clarity in the auction design. In light of DotEcon's analysis and advice, ComReg is now considering Modified Option 1 to determine whether it would allow ComReg to best achieve its objectives, in particular by incorporating some of the important benefits of options that were proposed by stakeholders.

ComReg is also cognisant of the views expressed by existing GSM licensees relating to their interpretation of the Director's Statement in ODTR 01/96. ComReg developed an option based on a particular implementation of elements in the Director's Statement and included consideration of this option in both this Draft RIA and the following Section regarding the objectives of the efficient management and use of spectrum and promoting regulatory certainty.

The analysis set out in the draft RIA is without prejudice to ComReg's view regarding the circumstances surrounding the ODTR's statement and any views which ComReg may put forward regarding the legal effect (or otherwise) of the Director's Statement.

Therefore, for the purpose of this Draft RIA, ComReg is considering the following options:

1. The option set out in Meteor's response to Consultation 08/57 and Consultation 09/14 and the option set out in Vodafone's response to Consultation 08/57 – see Section 7 and Annex F.

2. The option set out in O2's proposal in response to Consultation 08/57: see Annex F.

3. The option set out in Ericsson's response to Consultation 08/57 and Consultation 09/14: see Section 7, Annex F and Vodafone's proposal as set out in 09/73.

4. The option set out in Vodafone's response to Consultation 09/14 and an option based on a particular implementation of elements in the Director's Statement.In the case of an option based upon particular implementation of elements in the Director's Statement in ODTR 01/96, continued availability of existing GSM 900 MHz spectrum assignments would be reviewed, or further reviewed, to determine, on a demonstrable need basis, whether any retention of such spectrum should occur until the end date of the 3G licences.

ComReg has felt it necessary to make several assumptions about such an option based upon the Director's statement (for the purposes of conducting this analysis only). In particular, it has been assumed that:

- prior to the expiry of their respective GSM 900 MHz licences in 2011, Vodafone and O2 would, following any "demonstrable need" assessment, each retain 2 × 7.2 MHz (full current assignment) or 2 × 5 MHz, restricted to GSM use[47], with which to continue providing 2G services to their respective customers, potentially up until the expiry of their respective 2.1 GHz licence;

- Meteor would continue to retain its existing 2 × 7.2 MHz assignment on a GSM-only basis and a needs assessment would be conducted closer to the expiry of its GSM 900 MHz licence in 2015. Alternative assumptions could be that Meteor may wish to return 2 × 2.2 MHz of spectrum prior to an auction for the award of currently allocated spectrum (and any spectrum not retained by Vodafone and O2 pursuant to the above) to compete for a liberalised 2 × 5 MHz block (in light of the 2 × 10 MHz spectrum cap) or that the auction design could include an option for early liberalisation for Meteor as contained in Modified Option 1;

- there would be regular "demonstrable need" assessments conducted for so long as Vodafone, O2 and Meteor continued to retain spectrum post their respective GSM licence expiry dates (such as every 2-3 years). This is because the demand for GSM services could diminish considerably before the expiry of their respective 2.1 GHz (3G) licences[48]. In this context, it is unlikely that, in the case of Vodafone and O2, holding a single assessment prior to licence expiry in 2011 to determine the need for GSM spectrum until 2021 (expiry of first 2.1 GHz licence) would best ensure the efficient management and use of spectrum;

- particular criteria for the assessment and evaluation of "demonstrable need" would have been established;

- any spectrum returned to ComReg following a needs assessment would be subsequently made available once the quantum of any spectrum so returned met the required block size (see below);

[47] This is because (a) it could not have been envisaged by the Director at the time that any retention would have been on a liberalised basis (b) it would not be particularly logical to liberalise any spectrum so retained to meet a demonstrated need to continue to provide existing services using a GSM 900MHz licence and (c) in light of potential distortions to competition should existing GSM licences be liberalised, having regard to existing asymmetries in spectrum holdings between existing mobile operators, without a competition which would provide non-discriminatory access to liberalised spectrum.

[48] ComReg also notes that an end date for the use of GSM in the 900MHz band is envisaged in the Amending Directive / EC Decision - being for so long as there remains "reasonable demand" for GSM services.

- blocks A and B would be auctioned on a liberalised basis as soon as possible (but following the initial needs assessment);

- usage fees for any spectrum retained would be determined:

  - administratively having regard to the best information available to ComReg at the time; or
  - by way of reference to the auction for currently unassigned spectrum (following the initial needs assessment);

- the 2 × 10 MHz spectrum cap would apply to any licensee in the band. This, however, creates an issue in terms of the spectrum block size with which to allocate unassigned spectrum. For instance, should existing GSM licensees retain 2 × 7.2 MHz following any needs assessment, then it would not be feasible to award blocks in lots of 2 × 5 MHz. In this regard, ComReg notes Vodafone's proposal put forward in response to Consultation 09/14, which uses a 2 × 200 kHz block sizes, and this analysis will use that assumption. It may also be possible that existing licensees, Vodafone and O2, may retain only 2 × 5 MHz post-licence expiry (whether due to lack of need for, or choosing to return, 2 × 2.2 MHz each) and the analysis will also be conducted on this basis; and

- in terms of spectrum realignment between operators, the analysis considers the implications of using an administrative method and also via a two-stage auction (where bidders could bid for the place in the band in the second stage);

- ComReg's Option 2 (as presented in 09/14) and O2's modified Option 2 (see Section 7 and Annex F);

- ComReg's Option 1 (as presented in 09/14) and UPC's proposal in response to Consultation 08/57 (modified Option C) - see Annex F for details; and UPC's proposal in response to Consultation 09/14 (Modified Option 1) - see Section 7 and Annex F;

- Modified Option 1 with early release and time packages.

Having identified and described each of the options, the next step is to analyse each option in turn. This analysis in a RIA focuses on two factors – the impact on stakeholders and the impact on competition. Before each option is assessed in a tabular form, the next section outlines ComReg's views on the key issues that come up in terms of impacts on stakeholders and competition.

9.1.3 Impact on Stakeholders – Key Issues

Of themselves, the various RIA guidelines provide little guidance on how much weight should be given to the positions and views of each stakeholder group. Accordingly, ComReg has been guided by the objectives which it

must seek to achieve in exercising its functions, as set out in Section 12 of the 2002 Act.

As regards ComReg's objective of promoting competition, section 12 of the 2002 Act provides that ComReg is to take all reasonable and proportionate measures to ensure that users, including disabled users, derive maximum benefit in terms of choice, price and quality. In terms of the RIA, users' interests therefore are of particular importance, alongside those of other stakeholders, where the positions and views of potential new entrants should not be given lesser weight than those of existing operators. In the latter regard, the differing standpoints and situations of these stakeholders need to be taken into account, and Section 12 of the 2002 Act provides that ComReg is to take all reasonable and proportionate measures to ensure that there is no distortion or restriction of competition in the electronic communications sector and also to encourage efficient investment in infrastructure and promote innovation.

For their part, the Policy Directions require ComReg, in exercising its functions, to take into account, amongst other things, the national objective regarding broadband rollout, the state of the electronic communications industry and, in particular, the industry's position in the business cycle and the impact of regulatory decisions relating to the electronic communications market on the sustainability of the business of undertakings affected.

Pursuant to the Policy Directions, ComReg has had regard to these matters, and pursuant to Section 12 of the 2002 Act, ComReg has also taken into account relevant policy statements, published by or on behalf of the Government or a Minister of the Government and notified to the Commission, in relation to the economic and social development of the State. Further, ComReg has had regard to international developments concenring electronic communications networks and electronic communications services, associated facilities, and the radio frequency spectrum.

Additionally, the following general comments should be borne in mind when reading the stakeholder analysis that follows:

1. As discussed in Section 5.3 of 08/57, liberalisation of the 900 MHz band has the potential to bring many notable benefits to consumers, a point clearly acknowledged by many respondents. A report by Vilicom, which was commissioned by ComReg, estimated that deploying a UMTS network at 900 MHz would cost 65.6% of the cost of deploying a UMTS2100 network[49]. Therefore the use of the 900 MHz band to roll out a 3G network represents a substantial opportunity to increase both

[49] Page 2 of ComReg 09/14a – Redacted Vilicom Report on UMTS network design and cost, 23 March 2009,. Vilicom's estimates include the cost of turnkey rollout, the Radio Access Network (RAN), the core network, the service layer, mediation, provisioning, middleware & applications, network management and customer management. The estimates are based on a network to provide 95% population coverage and 80% geographical coverage.

consumer and producer surplus. How these gains are shared depends on, *inter alia*, how responsive demand is to price reductions. If the use of the 900 MHz band to roll out a 3G network was to lower mobile data prices by say 10%, and assuming constant volumes, this would result in savings to *existing* customers in the region of €40 million annually[50]. This is separate to the benefit obtained by new customers and the higher profit per customer that the mobile operators would achieve. ComReg believes that the earlier liberalisation occurs, the better this is for both consumers and operators. This is because the benefits start to accrue earlier and over more years, while these benefits are delayed if liberalisation is postponed. Thus, an option which delivers liberalisation of the full band at an earlier date is deemed preferable to an option which delivers it at a later date, all other things being equal. Again, the degree of competition in the market is important in ensuring that the gains are also shared by consumers. Thus, options that bring about more liberalised spectrum at any point in time are to be preferred.

2. It is now well accepted that a competitive auction is a highly efficient and effective means by which to ensure that entities which value spectrum the most obtain the rights to use it. Indeed, there has been a general shift away from the administrative assignment of spectrum by spectrum regulators around the world in favour of using an auction process to award spectrum assignments. Awarding spectrum by an auction ensures that licences are awarded to those bidders with the strongest business cases which usually corresponds to their ability to generate the most economic and social value[51]. An operator should only value spectrum more than its competitors in an auction if it can make more profits over the period in which it holds the spectrum right. It can only believe this if it intends to sell more at a lower cost. Thus, competitive auctions are the best means to ensure that the welfare of society is maximised in the context where spectrum rights of use are sold. Although used for a different purpose the welfare analysis in Annex F of Consultation 08/57 indicated that the current use of 900 MHz spectrum delivers over €2 billion in total welfare annually (consumer surplus plus producer surplus), and over a 15 year period, this represents over €30 billion in net present value terms. An auction of 900 MHz spectrum on a liberalised basis would result in even higher levels of consumer and producer surplus, as discussed above. Thus, even based on the estimates from the current use of the spectrum, it is easy to see that even small losses or unrealised potential gains would

[50] This figure is calculated from the statistics on mobile data revenues contained in ComReg's Quarterly Report. Based on the most recent Quarterly Report (09/71), mobile data revenue amounted to almost €400 million in the last four quarters (Q3 2008 to Q2 2009 inclusive). See Figure 4.4.1, page 53.

[51] For further discussion of this general assumption see, for example, *The use of auctions in spectrum assignment* prepared by A-Focus AB and DotEcon for Post & Telestyrelsen (PTS), the Swedish regulator for post and electronic communications (April 2004), in particular pages 5-8, and Binmore, K.G. and Klemperer, P. (2002) The biggest auction ever: the sale of the British 3G telecom licences. The Economic Journal, 112 (478). C74-C96.

have a substantial impact on welfare over the period of the new liberalised licences. Ensuring that each of the spectrum blocks is awarded to the operators that value them the most is critical in ensuring that the welfare effects of liberalising the band are maximised. The problems that arise when spectrum is administratively assigned are explored below.

3. An important consideration is whether the assignment of spectrum should involve the administrative assignment of spectrum to incumbents (with no comparative or competitive selection) or whether spectrum should be awarded on the basis of a competitive assignment (e.g. auction). The administrative assignment of spectrum to incumbents would clearly be to their benefit but would, in ComReg's view, negatively affect consumers and competition in general. In particular, there would be no certainty that the incumbents would be the best users of liberalised 900 MHz spectrum over the coming years. In such circumstances, there is a risk that an administrative assignment of spectrum would:

   - artificially distort who can access spectrum;
   - reduce the likelihood of entry by reducing the amount of spectrum available for competitive assignment;
   - potentially discriminate against H3GI or any other potential new entrant to the band; and
   - decrease regulatory certainty about licence expiry and subsequent availability to other users of spectrum – including existing competing economic operators without this spectrum or potential entrants - in the relevant spectrum band and potentially more broadly. With regard to the latter, ComReg notes that there are many classes of Wireless Telegraphy licences in Ireland which have explicit/fixed licence durations/expiry dates and, in these circumstances, it is critical for industry regulatory certainty for ComReg to apply, and be seen to be applying, an open, transparent, and non-discriminatory approach to access to spectrum.

   There would be a major cost to society associated with potentially granting the spectrum to the 'wrong' operator through an administrative assignment, that is, an operator who is not the best user of the spectrum for a period of time.

4. The potential for disruption to consumer services arises due to the expiry of licences. Disruption is seen by ComReg as primarily a consumer issue. ComReg believes that the potential for consumers to face disruption under any likely outcome is low or very low. In this regard ComReg refers to Section 6.6 of this document.

5. A further significant disadvantage associated with administrative assignment is that it would require ComReg to set licence fees via

administrative processes. This could result in licence fees being set either too low or too high (thereby potentially putting incumbents at a significant advantage, or disadvantage). Under such an approach, ComReg would have to set licence fees on an administrative basis for spectrum retention/licence extension. As ComReg is of the firm view that such licence fees must reflect the opportunity cost of the spectrum in its alternative 3G use (see Section 5.2 of Consultation 09/14), the fees for retaining spectrum might be considered punitive by the existing licensees as licensees would only be permitted to use this spectrum for 2G use. In summary, there is no guarantee that any administrative fee would be capable of accurate and optimal calibration; indeed it seems more likely that it would be incorrect, and legally contestable.

6. In principle, it would appear that a competitive assignment of spectrum rights of use would be beneficial to consumers, new entrants and competition. It would:

    a. ensure equal access to spectrum for all operators;
    b. ensure that the spectrum goes to the operator who values it the most;
    c. increase the possibility of new market entry;
    d. maximise the benefits associated with a fully liberalised 900 MHz spectrum;
    e. ensure that consumers fully benefit from the additional and improved services which can be delivered using liberalised spectrum.

9.1.4 The Impact on Competition – Key Issues

Access to liberalised spectrum at 900 MHz will be very important for those seeking to be strong competitors in advanced wireless services. There is a limited amount of spectrum available which places a constraint on the number of operators who can access the spectrum. Creating the correct *ex ante* conditions which maximise the potential for competition is therefore of critical importance. Such considerations underlay ComReg's decision to limit the amount of spectrum that any one entity could hold in the 900 MHz band to a maximum of 2 × 10 MHz.

It is therefore important to ensure that no further artificial limitations are imposed on the level of competition. Limiting the amount of spectrum that is available to new entrants *ex ante* reduces the opportunities for entry. A reduction in the likelihood of entry reduces competitive pressure in the market and reduces incentives to innovate which is likely to result in a slower roll-out of advanced wireless services.

To promote and maximise the benefits of competition, ComReg is of the view that the full band should be awarded by competitive assignment, with no spectrum awarded by direct administrative assignment. The administrative

assignment of spectrum, without any competitive or comparative process, would reduce the stimulus for innovation if incumbents faced limited opportunities for entry into the mobile market by potential competitors.

All respondents to the consultations recognised the importance of this scarce and in-demand spectrum. It is therefore vital that it is put to its best possible use. It is ComReg's view that the best way of ensuring that the spectrum is put to its best use is through an open competition. Such a competition should deliver this outcome in an open, transparent and non-discriminatory manner. On the other hand, the administrative assignment of spectrum to existing licensees does not provide any such assurance. Awarding spectrum rights by administrative decision creates a risk that ComReg makes a misjudgement and awards the spectrum to an operator who will not put it to its best use. The costs associated with making an error of judgement would be borne by society as a whole, and users in particular, as they would not reap the maximum benefits associated with this scarce resource. Notwithstanding ComReg's expertise and good intentions, the possibility of such a misjudgement occurring should not be discounted, especially in view of the lack of pertinent objective market benchmarks, and the associated high dependence on data provided by an interested party (i.e. the relevant incumbent MNO seeking additional spectrum rights).

Reducing the amount of spectrum available via an open competition would reduce the competitive benefits associated with liberalising the band. This option could not assure that each block of spectrum goes to the operator(s) who values it the most. There is an opportunity cost to society of granting licence renewals to incumbents and thereby denying the spectrum to other potential operators. In proposing to impose a spectrum cap ComReg is creating an opportunity for increased competition to take place. This should have an important and immediate effect on consumer welfare, and, in particular, an effect on the price, quality and range of services available to users. By means of the proposed allocation of the spectrum by auction ComReg considers that it could guarantee that the operators that value the spectrum the most - and hence will produce the greatest value to societal welfare over the period of the licence - will obtain the spectrum. ComReg believes that the selection of an appropriately designed auction process is the best and most transparent, non-discriminatory, and proportionate measure that would serve to encourage efficient use and effective management of the relevant spectrum. ComReg believes that this will produce the maximum benefit to society but particularly to consumers in terms of services, prices, choice, quality and innovation.

There now follows a detailed analysis of the stakeholder's proposals.

Meteor's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal in response to Consultation 08/57

Meteor's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal in response to Consultation 08/57			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS		These options would deliver early liberalisation of the full band (or mid-2011 at the latest)[52]; and as all the existing players already have networks in place they could commence the roll-out of new 3G networks immediately, subject to the realignment of some of their current 900 MHz assignments. There would be little risk of disruption/temporary drop in quality of service to consumers as all existing licensees would receive automatic renewal for liberalised use.	These options would involve the administrative assignment of 2 × 10 MHz of spectrum to each existing licensee until the expiry of the 3G licences in 2021, thereby leaving only one block of spectrum to be auctioned on a competitive basis. This is the largest administrative assignment of liberalised spectrum in any of the options considered. New entrants would be seriously constrained in their opportunities to gain access to liberalised 900 MHz spectrum. With only one block available for new entrants, this would restrict participation in the auction perhaps limiting it to H3GI, as the only other operator currently with access to other spectrum bands. This option would be likely to reduce the competition benefits associated with liberalised 900 MHz spectrum as the lack of competitive pressure may delay the existing licensees in rolling-out new 3G networks.
IMPACT ON INDUSTRY STAKEHOLDERS	**EXISTING GSM LICENSEES**	These options would be highly advantageous to the existing GSM licensees. It would strengthen the position of the existing licensees. Existing licensees would not have to compete against each other or other operators for access to liberalised 900 MHz spectrum. They would be each granted new licences for liberalised 900 MHz use at least until their 3G licences expire (earliest in 2021). In addition, their spectrum assignments would be increased by approximately 39% to 2 × 10 MHz. This would arguably, in effect, reward O2 and Vodafone for, or protect them against the consequences of, not taking any steps	Under these options, existing licensees would face a small risk of a new entrant who wins Block A gaining a short term first mover advantage as Block A will be available for liberalised use and could potentially be auctioned prior to mid-2011 (up to 18 month head start).

[52] Under Vodafone's proposal, the full band is liberalised by mid-2011 when the first GSM licences expire. It is assumed that under Vodafone's proposal, Meteor's licence would be liberalised in 2011 also. Block A would be auctioned for liberalised use as early as possible (i.e. before 2011) to a new entrant.

Meteor's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal in response to Consultation 08/57			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
		to migrate their customers to 3G services prior to their licence expiry in mid-2011[53]. It would minimise any migration costs incurred by the operators as they would be under no time pressure to migrate customers to 3G. This option would also be advantageous to the existing operators as limiting the spectrum available to new entrants to just one 2 × 5 MHz block would likely curb interest. If, for instance, only H3GI were to participate in an auction for this block, and licence fees for the incumbents licences were based on the auction results (as suggested under this proposal), this would result in very low licence fees, thus conferring an additional advantage on the incumbents. Any extension would allow the existing GSM licensees additional time to profit from their 2G licences. Their original investment decisions were made on the basis of a 15 year licence horizon. Such an approach provides opportunities for the existing GSM licensees to earn substantial additional profits on their assets beyond their licence horizon. It would also give them substantially more time to transfer existing 2G customers to 3G.	

[53] This could be seen as an example of the economics concept of moral hazard whereby operators would have an incentive not to take steps in advance of a licence expiry and then use this inaction as a reason to renew the licences.

Meteor's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal in response to Consultation 08/57			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
	OTHER OPERATORS	Other operators would be able to bid for one block of liberalised spectrum. However this is automatically guaranteed under the spectrum cap of 2 × 10 MHz. The new entrant who wins Block A could gain a short term first-mover advantage (up to 18 month head start). This option could be seen as advantageous to H3GI. If H3GI, being the only other operator who has access to other spectrum, is the only bidder for a single 5 MHz block, it would not face any competition for this block.	There would be limited opportunity for new entrants to access 900 MHz spectrum with only one 2 × 5 MHz block available in an auction[54]. H3GI is the only other operator in the Irish market who has access to other spectrum (at 2100 MHz) that can be used to feasibly provide mobile services. If access to other spectrum is deemed as important for a holder of a single 2 × 5 MHz block, other potential bidders may not see a viable entry opportunity with only one 2 × 5 MHz block of 900 MHz and H3GI may be the only other bidder. On the other hand, this option could be highly detrimental to H3GI. H3GI would be prevented from bidding for two blocks. As a 3G-only operator, liberalised 900 MHz spectrum is likely to be very attractive spectrum to H3GI, and H3GI could potentially be better placed than any existing GSM licensee to utilise the spectrum most efficiently but would be prevented from bidding for this use.
IMPACT ON COMPETITION		This option would result in the immediate liberalisation of the band.	Each of the three existing licensees would be automatically granted a licence for 2 × 10 MHz of liberalised spectrum until 2021. The incumbent operators would be granted not only an automatic licence extension, but also awarded additional spectrum. This would leave just one block available for competitive assignment. There would be a low likelihood of new entrants into the Irish mobile market. Only one block would be awarded to a new entrant to the band with probably only limited interest, perhaps

[54] In its proposal in response to 09/14, Meteor does refer to the possibility of releasing more spectrum in future when migration from 2G to 3G is complete. However no details are provided on how much spectrum may become available is provided or the likely timeframe for its release.

Meteor's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal in response to Consultation 08/57		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
		favouring H3GI who has expressed an interest in the band and who already has spectrum at 2100 MHz. In such a scenario, H3GI would be limited to only one 5 MHz block, thus constraining the competitive impact it could have on the market. H3GI is a 3G only operator and may have a higher valuation on two blocks of spectrum than an existing licensee. This would be particularly detrimental to the potential for competition. By limiting new entrants to just one single block this could curtail the successful bidder's future options for the following reasons: • A single block of 2 × 5 MHz may not support the efficient use of future wideband technologies requiring contiguous assignments of 2 × 10 MHz or more; • A licensee with no other spectrum holdings would have to deploy more base station sites to mitigate the capacity limitations of a single block should network traffic exceed this; • In the case where an operator intends to migrate to a new technology in the future, holding only a single block of 2 × 5 MHz may require a hard-switchover to the new technology. Temporary service disruption would be a likely outcome of such a rapid transition. In contrast, if the operator concerned held two blocks of 2 × 5 MHz, a phased approach to technology transition could avoid such disruption, as two blocks could facilitate a period where both new and legacy technologies operate in parallel. When customer migration to the new system was completed, the legacy system could

Meteor's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal in response to Consultation 08/57		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
		then be discontinued. Customers could therefore be migrated in a smoother fashion if an operator holds two blocks. This option would have the potential to cement the existing market structure in the Irish mobile market. It would strengthen the position of the existing licensees at the expense of potential competition. It assumes that the current configuration/use of the band is the most efficient use of the band. This would be detrimental to encouraging investment. With a low likelihood of new competition entering the market, the lack of competitive pressure could lead to a delay in the deployment of 3G services at 900 MHz. With limited outside competition, the three existing licensees would have much lower incentives to roll-out new services to customers, and may continue focusing on 2G only. This option would arguably reward O2 and Vodafone for, or protect them against the consequences of, not taking steps to migrate their customers to 3G before their licences terminate. The extent to which efforts have been made to migrate customers from 2G to 3G in anticipation of 2G licence-expiry has been a matter within these operators' control. It is likely that the Irish market would be seen as a much less attractive proposition for new entrants.

O2 proposal in response to Consultation 08/57

O2 proposal in response to Consultation 08/57			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS		As this option would involve an administrative assignment of 2 × 7.5 MHz of liberalised spectrum to each existing GSM licensee, consumers would not face any potential for disruption to existing services. Liberalisation of the band would occur relatively soon.	As this option would involve the administrative assignment of spectrum, this option would not guarantee that spectrum goes to the operator(s) which values it the most. If not, then such an approach could impair the delivery of new and innovative consumer services. This option would be likely to reduce the competition benefits associated with liberalised 900 MHz spectrum as the lack of competitive pressure may delay the existing licensees in rolling-out new 3G networks.
IMPACT ON INDUSTRY STAKEHOLDERS	**EXISTING GSM LICENSEES**	The administrative assignment of liberalised spectrum, without the challenge of competition for these spectrum rights, would be of clear financial and competitive benefit to existing GSM licensees. The proposed auctioning of five lots of 2 × 2.5 MHz would be advantageous to existing GSM licensees as they would be guaranteed 2 × 7.5 MHz of liberalised spectrum, and therefore they would need only to secure a single block of 2 × 2.5 MHz each to obtain the maximum amount of liberalised holdings permitted given the constraint of the 2 × 10 MHz spectrum cap. Any extension would allow the existing GSM licensees additional time to profit from their 2G licences. Their original investment decisions were made on the basis of a 15 year licence horizon. Such an approach provides opportunities for the existing GSM licensees to earn substantial additional profits on their assets beyond their	Existing licensees have argued that they would each need 2 × 10 MHz of spectrum to maintain GSM services and roll out new 3G networks at 900 MHz. Under this option, the existing operators would only be guaranteed 2 × 7.5 MHz and would each have to bid for 2 × 2.5 MHz of spectrum in an open auction against other potential bidders.

		licence horizon. It would also give them substantially more time to transfer existing 2G customers to 3G.	
	OTHER OPERATORS	Other operators would be able to bid for 2 × 12.5 MHz of liberalised spectrum between them.	Due to the administrative assignment of 2 × 7.5 MHz of liberalised spectrum to each incumbent, new entrants would not be able to bid for the full band – only 2 × 12.5 MHz (a little over 1/3 of the band) would be awarded via competitive assignment. An individual block of 2 × 2.5 MHz would not be attractive to a new entrant as 5 MHz is the minimum needed to support a UMTS channel. The use of 2 × 2.5 MHz block sizes could give rise to added difficulties for these operators obtaining contiguous spectrum..
IMPACT ON COMPETITION		Under this option, of the 2 × 12.5 MHz available, 2 usable blocks of 2 × 5 MHz each would be available for new entrants, thus creating the potential for new entry into the band.	Each existing licensee would be automatically granted a licence for 2 × 7.5 MHz of liberalised spectrum. This would leave only 2 full 2 × 5 MHz blocks of spectrum available for other operators to bid for. This artificial limitation on the amount of spectrum available to new entrants would distort competition. There is an opportunity cost to society of making a direct assignment to incumbents and thereby denying the spectrum to other potential operators who may value it more. Spectrum may not end up in the hands of the operators who value it the most. This option would arguably reward the incumbents for not taking steps to migrate their customers from 2G to 3G in an orderly fashion in advance of licence expiry. It is likely that the Irish market would be seen as a much less attractive proposition for new entrants.

Ericsson's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal as set out in 09/73

Ericsson's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal as set out in 09/73			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS		By granting each existing licensee a guarantee of one 2 × 5 MHz block (for liberalised use), the potential for consumer disruption is minimised. More than half of the total 900 MHz block would be auctioned with the full band immediately liberalised**.**	These options would involve the administrative assignment of 2 × 15 MHz of liberalised spectrum to existing licensees in total. In addition, under Vodafone's option, each existing licensee would administratively be assigned 2 × 10 MHz of liberalised spectrum until mid 2015. There is no guarantee that these operators value the spectrum more highly than other parties, and if not then such an approach could impair the delivery of new and innovative consumer services.
IMPACT ON INDUSTRY STAKEHOLDERS	**EXISTING GSM LICENSEES**	These options would favour existing licensees over new entrants by reserving one block of (liberalised) spectrum each beyond their licence expiry without facing any competition for this block of spectrum. In addition, under Vodafone's proposal, all existing licensees' would be granted 2 × 10 MHz of liberalised spectrum until mid 2015. Any extension would allow the existing GSM licensees additional time to profit from their 2G licences. Their original investment decisions were made on the basis of a 15 year licence horizon. Such an approach provides opportunities for the existing GSM licensees to earn substantial additional profits on their assets beyond their licence horizon. It would also give them substantially more time to transfer existing 2G customers to 3G.	Existing licensees have argued that they would each need 2 × 10 MHz of spectrum to maintain GSM services and roll out new 3G networks at 900 MHz. Under Vodafone's proposal, each existing licensee would be guaranteed 2 × 10 MHz, but only on a short term basis, until mid 2015. Under these options existing licensees would only be guaranteed 2 × 5 MHz in the long term and would face competition from new entrants if they wished to bid for a further 2 × 5 MHz of spectrum.
	OTHER OPERATORS	Under these options, four blocks of liberalised spectrum would be auctioned on a liberalised basis and available for other operators to compete for.	Due to the administrative assignment of 2 × 5 MHz of liberalised spectrum to each incumbent, for long term use, and 2 × 10 MHz for short term use under Vodafone's proposal, new entrants would not be able to bid for the

Ericsson's proposal in response to Consultation 08/57 and Consultation 09/14 and Vodafone's proposal as set out in 09/73			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
		Under Vodafone's option, one of these blocks would be available immediately, with the other three available for use from mid 2015.	full band, and their options would be further limited under Vodafone's option by delaying access to liberalised spectrum for other operators. These options would favour existing licensees. It would reduce the amount of spectrum available in a competitive auction. It would discriminate against new entrants as granting automatic spectrum licences to existing licensees would limit access to spectrum for other operators.
IMPACT ON COMPETITION		These options would result in the immediate liberalisation of the band. Under this option, four blocks would be auctioned, thus creating the potential for market entry. Under Vodafone's option, one of these blocks would be available immediately, with the other three available for use from mid 2015.	Under Ericsson's proposal each existing licensee would be automatically granted a licence for 2 × 5 MHz of liberalised spectrum. This would artificially leave only 4 full 2 × 5 MHz blocks of spectrum available for other operators to secure, potentially distorting competition. In addition, under Vodafone's option, each existing licensee would be administratively assigned 2 × 10 MHz of liberalised spectrum until mid 2015. As such only a single 2 x 5 MHz block would be available for other operators to secure in 2010, potentially distorting competition. There is an opportunity cost to society of granting licence renewals to incumbents and thereby denying the spectrum to other potential operators. Spectrum may not end up in the hands of the operators who value it the most. This option would arguably reward the incumbents for not taking steps to migrate their customers from 2G to 3G in an orderly fashion in advance of licence expiry.

Option based upon GSM Licensees' Interpretation of Director's Statement in ODTR 01/96 and Vodafone's proposal in response to Consultation 09/14

Option based upon a Particular Implementation of Elements in Director's Statement in ODTR 01/96 and Vodafone's proposal in response to Consultation 09/14			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS		As this option would involve the potential for an administrative assignment of up to 2 × 7.2 MHz to each existing GSM licensee up to the term of existing 3G licences, consumers would not face any potential for disruption to existing services.	As this option would involve the potential for the administrative assignment of spectrum, this option would not guarantee that spectrum goes to the operator(s) which values it the most. If not, then such an approach could impair the delivery of new and innovative consumer services. The liberalisation of the band would be significantly delayed, as spectrum retention would be for 2G use, thus limiting the full benefits associated with liberalising the band for many years.
IMPACT ON INDUSTRY STAKEHOLDERS	**EXISTING GSM LICENSEES**	As this option could allow existing GSM licensees to retain spectrum in the 900 MHz band for 2G use beyond their 15 year licence expiry dates without the challenge of competition for these spectrum rights, it would be of clear financial and competitive benefit to these licensees. The existing GSM licensees would have the opportunity to put forward evidence to ComReg to maintain some or even the entire spectrum they currently hold in the 900 MHz band.	Although existing operators have highlighted the importance of accessing liberalised spectrum, spectrum retention under this option would not provide access to liberalised spectrum. Spectrum which is limited to 2G only use until the expiry of the 3G licences is not likely to be attractive to those existing licensees seeking to roll out advanced networks. Further, existing GSM licensees may have to divert resources into demonstrating how much spectrum they would need to in order to continue offering 2G services. It may be difficult, if not impossible, for ComReg to ensure that this process would be sufficiently transparent and accurate (e.g. independently verified) given the confidential and commercially sensitive nature, and the likely conditionality, of the information which would be required to be submitted by the incumbents. Such a process would be likely to cause both existing GSM licensees and ComReg (and potentially other operators) to incur significant costs.

Option based upon a Particular Implementation of Elements in Director's Statement in ODTR 01/96 and Vodafone's proposal in response to Consultation 09/14			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
	OTHER OPERATORS	New entrants would have the opportunity to bid for at least two blocks of liberalised spectrum (Blocks A and B) which are currently unassigned and would be available for immediate use.	If each of the existing GSM licensees retained their full current spectrum assignment spectrum under the processes envisaged by this option, then new entrants would be limited to potentially accessing only 10 MHz of the band. If the process for the assignment of unassigned 900 MHz spectrum is delayed, due to the spectrum retention process, this would delay the availability of liberalised 900 MHz spectrum to new entrants. In addition, the lack of certainty regarding the outcome of the spectrum retention process could discourage new entrants from participating in an auction for the spectrum. Other operators would have little or no visibility as to the quantum and timing of available liberalised 900 MHz spectrum as this would be determined by the outcome of the spectrum retention processes.
IMPACT ON COMPETITION		Under this option, at least two blocks of liberalised spectrum would be available for new entrants, thus creating the potential for new entry.	Under this option, in the event that Vodafone, O2 and/or Meteor retained spectrum for 2G only use, the earliest date the full band would be liberalised and competitively assigned would be after the expiry of the current 3G licences. This option could entrench the position of existing GSM licensees and may lead to less intensive competition in the future. This option would reward existing GSM licensees for not taking steps to migrate their customers from 2G to 3G in an orderly fashion in advance of licence expiry. It is likely that the Irish market would be seen as a much less

Option based upon a Particular Implementation of Elements in Director's Statement in ODTR 01/96 and Vodafone's proposal in response to Consultation 09/14		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
		attractive proposition for new entrants.

ComReg's Option 2 and 02's proposal in response to Consultation 09/14 (modified Option 2)

ComReg's Option 2 and 02's proposal in response to Consultation 09/14 (modified Option 2)			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS		As this option would involve the potential for an administrative assignment of up to 2 × 7.2 MHz for 2G use to Vodafone and O2 up to 2015, there is a very low risk that consumers of these licensees would face any potential for disruption to existing services in the immediate future. Two blocks of spectrum would be auctioned (although under O2's option this could be delayed until after the spectrum retention assessment was completed). All GSM licences would remain in place until mid-2015, removing any possibility for consumer disruption before then.	Option 2 presents the small possibility that consumers could face disruption in mid-2015. Under Option 2, the full liberalisation of the band would be delayed. Spectrum would be liberalised in two tranches, with some liberalised at/before mid-2011 (probably 2-3 blocks) with the remainder being liberalised by mid-2015. The full competition benefits associated with liberalisation of the band would not materialise until 2015 - nearly six years from now – due to the granting of licence extensions for 2G use. Spectrum for 2G use only would be administratively assigned to Vodafone and O2 for a four year period. These operators may not be the best users of the spectrum (i.e. the operators who value it the most). In addition, as they would be limited to 2G only use, they would be preventing other operators using this spectrum for liberalised use to roll out potentially lower-cost networks capable of delivering better services to consumers. Administrative assignment to new entrants would also be highly unlikely to award the spectrum to the firm that values it the most. Such an approach could, as discussed in more detail above, impair the delivery of new and innovative consumer services.
IMPACT ON	**EXISTING**	This option may be considered to be advantageous for	Under this option ComReg would have to set licence fees on an

ComReg's Option 2 and 02's proposal in response to Consultation 09/14 (modified Option 2)			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
INDUSTRY STAKEHOLDERS	**GSM LICENSEES**	Vodafone and O2 as it would effectively give them first right of refusal on up to 3 spectrum blocks for 4 years. Both O2 and Vodafone would be granted a guaranteed amount of spectrum for 2G use until 2015, four years after their original licences terminate. This would allow them an additional 4 years to profit from their 2G licences. Their original investment decisions were made on the basis of a 15 year licence horizon. Such an approach provides opportunities for Vodafone and O2 to earn substantial additional profits on their assets beyond their licence horizon. It would also give Vodafone and O2 substantially more time to transfer existing 2G customers to 3G. Vodafone and O2 would have the opportunity to put forward evidence to ComReg to maintain some or even the entire spectrum they currently hold in the 900 MHz band for a period of up to four years. This could potentially enable Vodafone and O2 to bid on liberalised spectrum, if they were to be permitted to retain only 5 MHz for 2G services. Both Vodafone and O2 would then be able to bid for one of the first liberalised blocks A, B, and any other spectrum made available, potentially gaining first mover advantage. When the remaining blocks are auctioned for liberalised use in mid-2015 there may be more certainty regarding the Digital Dividend spectrum and in particular the neighbouring harmonised sub band 791-862 MHz, which is perhaps advantageous for the existing licensees who would all likely hold 2G licences up to mid-2015 under	administrative basis for spectrum retention. As ComReg is of the firm view that such licence fees must reflect the opportunity cost of the spectrum (see Section 5.2 of 09/14), the fees for retaining spectrum might be considered punitive by the existing licensees as licensees would only be permitted to use this spectrum for 2G use (indeed some respondents have expressed such views in their consultation responses). There is no guarantee that any administrative fee would be capable of accurate or optimal calibration and would more likely distort incentives and create potential for delays. A four year roll-over may be considered too short by incumbents, and would provide only limited certainty for Vodafone and O2. Also the extension would only permit 2G use. Existing licensees would still have no guaranteed access to liberalised 900 MHz spectrum post-2015; all would have to compete for new liberalised licenses in 2015. Assuming that Vodafone and O2 requested and were granted a licence extension for 2 × 5 MHz of spectrum each, both operators would only be permitted to bid for one liberalised block at the first stage of the competition due to the spectrum cap of 2 × 10 MHz. Meteor would not be permitted to bid for any liberalised spectrum until 2015, when its 2G licence expires and this might disadvantage it vis-à-vis any operator who wins a liberalised licence for use from 2011. Both Vodafone and O2 could potentially have access to liberalised spectrum as well as 2G only spectrum during the period 2011-2015 and would therefore have a 4-year lead on Meteor in terms of rolling out a 3G network at 900 MHz. In its proposal, O2 contends that any auction should be deferred until the retention application process is completed. It is unclear how long such a

ComReg's Option 2 and 02's proposal in response to Consultation 09/14 (modified Option 2)			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
		this approach.	process could take but any deferral of the auction to allow conclusion of this process would reduce the time available between conclusion of the auction and the expiry of existing licences in mid-2011. In the case of an unsuccessful application for retention, or in the case of an unsuccessful bid in the auction, this would reduce the time period available for displaced incumbents to effect alternative measures.
	OTHER OPERATORS	Under this option, other operators would be able to compete in an open competition for all seven blocks of spectrum but only on a staggered basis. In terms of availability of this spectrum for use, at least two blocks of liberalised spectrum (Blocks A, and B) would be available for use immediately, with possibly one more block available in mid-2011, and the remaining blocks of liberalised 900 MHz spectrum would be available from mid-2015. A new entrant would have a good opportunity to gain first mover advantage (5+ years) as under the spectrum cap existing licensees (if permitted to retain their existing spectrum) would be precluded from bidding for blocks A,B, the first two liberalised blocks available, with most of the remaining blocks potentially unavailable for liberalised use until mid-2015.	Only a small amount of liberalised spectrum, 2-3 blocks, is likely to be available in 2011 with very limited opportunities for new entrants to bid for two contiguous blocks. New entrants may be discouraged from participating in an auction for new licences from mid-2015 if they view ComReg as favouring incumbents over new entrants. These factors may affect the willingness of new entrants to enter the market.
IMPACT ON COMPETITION		Under Option 2, there would be an open competition for all seven blocks between now and 2015. At least two blocks would be auctioned initially with the remainder becoming available in 2015 due to licence extensions and Meteor's licence expiry date.	Some spectrum would be administratively assigned to Vodafone and O2 for a 4 year period for 2G only use following a technical needs assessment. This would delay the liberalisation of these blocks and the roll-out of new 3G services using the full band. The full competition benefits associated with liberalisation would not

ComReg's Option 2 and 02's proposal in response to Consultation 09/14 (modified Option 2)		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
		materialise until 2015 - nearly 6 years from now – due to the staggered expiry of the GSM licences. It would not be until 2015 that the full band would be awarded via an open competition to operators who are using liberalised 900 MHz spectrum to compete head-on to provide advanced mobile services to customers. A significant first mover advantage would be achieved by the winner(s) of the blocks which are liberalised first and auctioned which may cause a serious competitive distortion. The successful bidder(s) would have potentially a 5 year head start and a significant cost advantage over other operators who do not have access to liberalised spectrum. This option would arguably reward the incumbents for not taking steps to migrate their customers from 2G to 3G in an orderly fashion in advance of licence expiry. In common with all similar approaches, the incumbents would have poor incentives to deal with this issue in the extra time that they have received. It is likely that the Irish market would be seen as a much less attractive proposition for new entrants.

ComReg's Option 1 and UPC's proposal in response to Consultation 08/57 (modified Option C) and UPC's proposal in response to Consultation 09/14 (modified Option 1)

ComReg's Option 1 and UPC's proposal in response to Consultation 08/57 (modified Option C) and UPC's proposal in response to Consultation 09/14 (modified Option 1)			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS		Under these options, full liberalisation of the band would occur by mid-2015, when the last GSM licence expires. All seven blocks would be auctioned. No operator would be administratively assigned spectrum. By having an open competition for spectrum, this should ensure that spectrum is efficiently used and that winning bidders are incentivised to provide 3G services to consumers as soon as possible, thereby bringing long term benefits to consumers.	Liberalisation of the entire band would not materialise until 2015 due to the staggered availability of liberalised spectrum, in line with the expiry dates of GSM licences. There is a risk that Vodafone's or O2's 2G consumers could experience short term disruption to mobile services in mid-2011 if either Vodafone or O2 failed to win at least one block each of liberalised 900 MHz spectrum. This risk is considered to be small[55], and there are mitigating factors which may come into play[56]. The potential for either Vodafone or O2 to be outbid and fail to win any liberalised 900 MHz spectrum, would depend on a new entrant or entrants successfully outbidding O2 or Vodafone in the auction. If both Vodafone and O2 were outbid in an auction, and failed to win any spectrum, this would mean that they were outbid by two new entrants eager to bring services to the market.
IMPACT ON INDUSTRY STAKEHOLDERS	**EXISTING GSM LICENSEES**	The auction process associated with this option is clear and would provide regulatory certainty for existing operators. An auction would be held prior to the expiry of each of their licences. All interested parties, including existing operators would be permitted to bid on an equal basis for liberalised 900 MHz spectrum subject to a cap of 2 × 10	Existing licensees would not be guaranteed spectrum at 900 MHz after their respective GSM licences expire (this is a point referred to by all incumbent MNOs at one point or another of their responses as being reason why a competitive award process should not be used). There would be a risk that existing licensees would not win as much spectrum as they have expressed a need for, i.e. 2 × 10 MHz.

[55] See, for example, ComReg/Vodafone bilateral meeting minutes.

[56] In particular see Section 9.1 of document 09/14.

ComReg's Option 1 and UPC's proposal in response to Consultation 08/57 (modified Option C) and UPC's proposal in response to Consultation 09/14 (modified Option 1)			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
		MHz.	If, for example, 10 MHz is secured by a new entrant(s) in the auction then one existing GSM licensee would have less 900 MHz than under its current GSM licence (from 2 × 7.2 MHz to 2 × 5 MHz, or potentially zero, if two new entrants outbid the existing licensee). If Vodafone and/or O2 were unsuccessful in the auction and secure less spectrum then they claim to need (2 × 10 MHz) they may incur costs to migrate customers from 2G to 3G before licence expiry. Vodafone has estimated that the migration cost is approximately [✂] per customer (based on an Ofcom estimate) for a handset upgrade if the auction results in Vodafone having no 900 MHz spectrum at all. Vodafone argue that a reduction in its GSM spectrum from 2 × 7.2HMz to 2 × 5 MHz in mid-2011 when its licence expires would cost it between [✂] assuming that 1800 MHz spectrum could not be used. ComReg analyses these claims by Vodafone in Annex H. Meteor's GSM licence does not expire until 2015. It would not be able to access liberalised spectrum until 2015 unless it chose to release at least 2 × 2.2 MHz of its existing spectrum assignment in advance of the auction due to the spectrum cap. It could potentially be disadvantaged vis-à-vis those existing and potential operators winning a liberalised licence available for use in 2010/11.
	OTHER OPERATORS	Under this option, existing GSM licensees would not have the advantage of any direct assignment of spectrum, and potential entrants would be able to compete to access the entire band (noting that spectrum availability would depend on the timing of expiry of existing GSM licences).	The staggered availability of spectrum could be unattractive to new entrants. Incumbents should have a more thorough knowledge of the business case for offering liberalised 900 MHz services, which in turn should best inform their bidding strategies in any competition.

ComReg's Option 1 and UPC's proposal in response to Consultation 08/57 (modified Option C) and UPC's proposal in response to Consultation 09/14 (modified Option 1)			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
		A new entrant would potentially have the opportunity to gain first mover advantage as the spectrum cap means that existing licensees would be precluded from bidding for Blocks A and B, the first two liberalised blocks available which are both currently unused and available for immediate roll-out. The next blocks of liberalised spectrum would not be available until mid-2011 thus providing a potential 18 month head start. Under UPC's proposal, 2 × 10 MHz of liberalised spectrum would be reserved for a new entrant which could create a strong platform for new entry.	UPC's proposal may discriminate against any new entrants who only want to have access to one spectrum block, but would be forced to bid for two. Imposing this requirement could constrain any potential for market entry.
IMPACT ON COMPETITION		Under this option, there would be an open competition for the full band ensuring that the spectrum is awarded to operators who value it the most. No operator would be administratively assigned spectrum and both incumbents and new entrants would be treated equally. The loss of spectrum by any of the existing licensees would not result in a decrease in retail competition as the spectrum would not disappear, simply it would be secured by an alternative operator. Competition at a retail level could intensify if there is new entry.	Liberalisation of the entire band would not materialise until 2015 due to the staggered availability of liberalised spectrum, in line with the expiry dates of GSM licences. There is a potential for a distortion to competition if Meteor chose not to participate at auction by returning at least 2 × 2.2MHz of its existing spectrum assignment, thus being unable to access liberalised spectrum until the expiry of its GSM licence in 2015.

Modified Option 1 with early release and time packages

Modified Option 1 with early release and time packages			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS		Under this option, the full band would be liberalised by mid-2011, assuming Meteor was to avail of the early release option outlined at Section 12.2.4 of this document. There would be an open competition for the full band. No operator would be administratively assigned spectrum. All new licences would be awarded by a competitive process. It would lower the possibility that consumers would face disruption compared to Option 1 as it would enable Vodafone and O2 to bid for short term licences (2011-2015). Thus, if an operator has only a short term need, or wishes to hold off until other spectrum bands become available, they would have this opportunity subject to being successful at auction. Also, as the auction would be held in 2010, it should allow sufficient time for existing operators to plan appropriately and address any consumer disruption issues that might arise if one or more incumbent MNO did not secure spectrum, or enough spectrum, in the competition.	Under this option there would still be a small risk of disruption to consumers in 2011 if Vodafone or O2 failed to win at least 1 block each. To the extent that Vodafone and O2 could make successful bids for a short time licence, this risk would be even further reduced.
IMPACT ON INDUSTRY STAKEHOLDERS	**EXISTING GSM LICENSEES**	This option would offer existing licensees flexibility in the auction as they could bid for spectrum in two time packages (2011-2015, 2015-2030). This would allow them to reveal their true preferences. For instance, an existing operator may place a very high value on access to liberalised spectrum between 2011-2015 but less so after that as they may hope to avail of other spectrum bands becoming available at that time. Also the auction process would allow existing operators who have a strong preference for	Under this option, the full band would be auctioned so existing licensees are not guaranteed spectrum at 900 MHz once their licences expire in mid-2011, and mid-2015 respectively. The existing licensees would have to compete in an open competition for liberalised 900 MHz spectrum against other interested parties.

Modified Option 1 with early release and time packages			
CRITERION		**ADVANTAGES**	**DISADVANTAGES**
		certain locations within the band, to express these preferences in their bids in the second round of the auction. As the competition would provide an early release option for Meteor it would not be left at any disadvantage due to the later expiry of its GSM licence (which could arise in original Option 1). It would remove the possibility of existing licensees being put at a disadvantage vis-à-vis other operators who may have been able to gain a first mover advantage with Blocks A and B. The auction process is clear, so all costs (e.g. re-tuning costs) could be factored into the operators bidding strategy. Existing licensees are well placed to determine the value of the spectrum and they could usefully rely on this to inform their bidding strategy.	
	OTHER OPERATORS	Under this option, other operators could compete in an auction for the full band of liberalised 900 MHz spectrum. At least five and potentially all seven blocks would be available to new entrants to bid on for release in 2011. As the maximum possible number of blocks would be available, this would remove any artificiality in pricing that could emerge as a result of any artificial restriction on the amount of spectrum auctioned.	Other operators would have to compete, on an equal basis, against all incumbents and this competition could intensify for those parties seeking 2 × 10 MHz of 900 MHz spectrum.
IMPACT ON COMPETITION		All new licences would be awarded via a competitive process and awarded to operators who value the spectrum most. No operator would be administratively assigned spectrum. The full band would be liberalised by mid-2011 (assuming Meteor avail of the early release option referred to elsewhere in this paper), using an auction process. As the auction would not be staggered, the benefits of liberalisation would be achieved earliest. An open competition for the full band would ensure that	As is the case with the original Option 1, a small risk of disruption to consumers still remains, however this risk is reduced given the additional mitigating factors which this modified Option 1 incorporates, namely the potential to bid for a shorter licence period 2011-2015.

Modified Option 1 with early release and time packages		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
	each block of liberalised 900 MHz licenses ends up in the hands of the operators who value it the most – this could be the existing licensees or new entrants - at the time they value the most. The auction would reveal these preferences in a fair, open and transparent way. The existing licensees point to the importance of liberalised 900 MHz spectrum so it is essential that it is put to its best use; this is best achieved through an open competition. Again there would be no risk that ComReg awards the spectrum to the wrong operator by making a misjudgement. This is important as the costs associated with making an error of judgement will be borne by society as a whole as it will not reap the maximum benefits associated with this resource. The option for Meteor to avail of early liberalisation should avoid competitive distortion in data services markets if access to sub-1 GHz 3G spectrum is a significant cost and/or quality differentiator. It avoids the situation whereby Meteor would be disadvantaged by its inability to compete for packages including lots in the less competitive 2011-2015 time-slice for liberalised access.	

9.1.5 Option Assessment and Selection

The options examined in this Draft RIA can be logically grouped into three main categories:

Category 1: Options which involve the automatic administrative assignment of new licences to existing licensees for various lengths of time;

Category 2: Options which provide for an assessment of the need of incumbents to retain spectrum to continue providing services to customers uninterrupted; and

Category 3: Options which involve the competitive assignment of all spectrum in the 900 MHz band.

In ComReg's view, certain options would not enable ComReg to achieve its objectives (in terms of both the objectives it is statutorily required to achieve in exercising its functions and its specific objectives for this process). Others may not be fully consistent with, or best discharge, ComReg's duties and statutory obligations.

Category 1

There are a number of options which fall into this first category – Meteor, Vodafone (response to 08/57 and proposal as set out in 09/73), Ericsson and O2's proposal in response to 08/57. In each case, these options involve the automatic administrative assignment of new licences to existing licenses for various lengths of time by being granted a licence, in some options for 2 × 5 MHz[57], or in other options for more spectrum than they currently have at 900 MHz (2 × 7.5 MHz[58] or 2 × 10 MHz[59]). In all cases, the administrative assignment of spectrum reduces the amount of spectrum available for competitive award. Meteor's and Vodafone's (08/57) proposals represent the most extreme case whereby only one block (2 × 5 MHz) would be available for competitive award.

The rationale behind the administrative assignment of spectrum is, in some cases, based on the justification of seeking to minimise disruption to consumer services. However, as noted above, ComReg considers that the probability of consumers facing disruption on any more than a minor scale is very limited. In addition, any such disruption would be of a limited duration.

In ComReg's view, the Draft RIA identifies a number of cogent arguments against the adoption of any of these options:

[57] Ericsson's proposal to Consultation 08/57 and 09/14 and Vodafone's proposal as set out in 09/73.

[58] O2's proposal in response to Consultation 08/57.

[59] Meteor's proposal to Consultation 08/57 and 09/14, Vodafone's proposals to Consultation 09/14 and Vodafone's proposal as set out in 09/73.

1. the administrative assignment of spectrum does not ensure that spectrum would be efficiently used by the best users of the spectrum, which could impair the delivery of new and innovative consumer services and thereby would not maximise the benefits to consumers over the longer-term;

2. whilst some options may reduce or eliminate the small probability of short-term consumer disruption, in ComReg's view they would do so at the greater risk of longer term disadvantage to consumer welfare through inefficient and inappropriately incentivised spectrum use by recipients of administrative assignments;

3. while some of the options would lead to early liberalisation of the band, they would seek to do so in a way that has the potential for serious long term market and competitive distortions by favouring existing GSM licensees over other mobile operators (particularly in light of existing asymmetries in spectrum holdings between existing mobile operators) and potential new entrants to the band in a potentially discriminatory manner;

4. such treatment would not best serve the achievement by ComReg of its statutory objective of promoting competition. For example, in the case of Meteor's and Vodafone's proposals, H3GI and new entrants would be prohibited from gaining access to 2 × 10 MHz of spectrum because only one block would be auctioned. Such an approach would, in ComReg's view, limit the opportunity for new entrants which would reduce the probability of new entry; and

5. ComReg remains of the view that where demand is likely to exceed supply for spectrum, that it would be contrary to its obligations of non-discrimination, fairness, proportionality and/or reasonableness to somehow favour current holders of licences, on the basis of their incumbency alone, in any spectrum assignment process.

Accordingly, these options are therefore rejected on this basis.

Category 2

This category encompasses those options wherein spectrum retention is not automatically granted to incumbent operators, but instead retention is assessed on the basis of 'need'. Nevertheless, incumbents are still granted preferential treatment or first right of refusal on spectrum (subject to ComReg granting rights to retain spectrum).

The proposals which fall into this category are: Vodafone's response to 09/14, Option 2, O2's modified Option 2 and the Option based on the incumbents' interpretation of ODTR statement in ODTR 01/96. In each case, some blocks of spectrum would be auctioned, with the total amount determined on the basis of the outcome of a spectrum retention process seeking to ascertain the amount of spectrum required to retained on the basis of need.

These options would have the advantage of involving, to a greater or lesser extent, delivery on the expectations claimed to be harboured by the incumbents that they might retain access to 2G spectrum beyond their respective 2G licence-expiry dates on a 'demonstrable need' basis, and of avoiding the consequences claimed by them to flow from any failure to retain such access.

While these options may also reduce or eliminate the small probability of short-term consumer disruption which has been focused on by certain respondents as a consequence, in ComReg's view they would do so (in common with the first category of options):

- at the greater risk of longer term disadvantage to consumer welfare through inappropriately incentivised and therefore inefficient spectrum use by recipients of administrative assignments. In this regard, even if existing operators could prove that they have a 'need' to continue holding spectrum, there is no guarantee that they are the best users of this spectrum, particularly as they will have to continue using this spectrum to only supply 2G services, rather than offering consumers more advanced services which the liberalised spectrum would be capable of delivering cost efficiently;

- by restricting or distorting competition, by reducing the opportunity for new entry; and

- in a fashion that, where demand is likely to exceed supply for spectrum, would be contrary to its obligations of non-discrimination, fairness, proportionality and/or reasonableness.

In addition, ComReg notes that these options would:

- delay the liberalisation of some or all of the band, either as a result of the spectrum retention assessment itself, or as a result of the outcome of the assessment whereby licence extensions were granted for 2G use; and

- involve administrative technical assessments of how much spectrum is needed for 2G. In ComReg's view, it is doubtful whether any such assessment would be sufficiently transparent and independently verifiable (and could thus lead to inefficient spectrum use and the attendant negative consequences for consumer welfare). In addition, such assessment processes would result in significant regulatory burdens (in terms of time, resources and cost) for existing GSM licensees, other operators (seeking to test the validity of the assessments) and ComReg. In addition, the nature of such processes lend themselves to considerable risk of delays.

Accordingly, these options are also rejected.

Category 3

The third category of options are those which involve the competitive assignment of spectrum and no direct assignment to incumbent operators. This category includes Option 1, UPC's options and Modified Option 1.

Option 1 offers significant advantages over Option 2 as it does not have the problems associated with direct assignment or distorting incentives for all spectrum bands. It involves a fair, transparent, proportionate process. All blocks would be auctioned and liberalised as the GSM licenses expire and the band would be liberalised far more progressively than Option 2. This means that consumers are more likely to reap the benefits associated with liberalisation sooner. However, Option 1 does have a number of potential disadvantages:

- there is a small risk of short-term disruption for consumers;
- there is the potential for competitive distortions as an operator(s) could gain a first mover advantage due to the earlier auctioning of the unused Blocks A and B before the rest of the band;
- it could leave Meteor at a competitive disadvantage as its GSM licence continues until 2015 and it would be unable to access liberalised spectrum until after this date; and
- There would be a requirement for a Memorandum of Understanding to address spectrum realignment.

In terms of customer disruption there are a number of factors that could mitigate consumer disruption:

- Use of other GSM spectrum (1800 MHz) – most users have dual band handsets;
- Port customers onto other networks of their choice, 2G or 3G, existing or new;
- Commercial national roaming agreements; and
- Time period between auction and mid-2011 new licence date.

9.2 The Preferred Option

While Modified Option 1 would also involve a small risk of short-term disruption for consumers (to which the same mitigating factors would still apply), the Draft RIA indicates that this option would nevertheless be the preferred option for the following reasons:

1. through the use of a competitive allocation mechanism, it would provide the greatest opportunity of maximising long-term consumer welfare appropriately incentivising efficient spectrum use and thus incentivising the provision of more advanced services which the liberalised spectrum would be capable of delivering cost efficiently;

2. it would enable the full liberalisation of the band to occur by mid-2011, by incorporating the "early release option" for Meteor;

3. the early release option would facilitate flexibility in the availability of the spectrum currently assigned to Meteor, and it would help neutralise any potential market distortions arising from asymmetries in GSM 900 MHz licence expiry dates;

4. as it would not involve administrative technical assessments regarding how much spectrum should be retained or the appropriate spectrum usage fee, it avoids the substantive and procedural risks, costs, burdens and delay that using such processes are likely to entail; and

5. by minimising potential market distortions (such as through the early release option) and making spectrum available in an open, non-discriminatory, fair, proportionate and reasonable manner that would not favour incumbents or potential entrants, it would best meet ComReg's objective of the promotion of competition and its regulatory obligations in relation to the awarding of spectrum rights of use.

6. It would provide a robust market mechanism for delivering efficient block locations with maximum contiguity and no administrative realignment in 2015.

ComReg developed this option in response to the important benefits that some aspects of the respondents' preferred options brought with them. In ComReg's view, Modified Option 1 enables ComReg to ensure that the spectrum is held by the bidders that value it the most, which in turn, will maximise the benefits to users and the economic and social welfare of society generally. Moreover, Modified Option 1 makes it possible that the whole of the band will be liberalised in 2011.

In summary, Modified Option 1 represents the option which should deliver the greatest benefits to all stakeholders and competition in the market, whilst minimising costs.

Request for Respondents' Views on the Draft RIA

ComReg will consider all comments received on the Draft RIA. Respondents are requested to comment on the Draft RIA generally and to provide any relevant material including any specific, quantitative material which supports their views. Any quantitative assessments should be substantiated and supported with evidence.

10 Evaluation of Options in Context of ComReg's Objectives

The preceding Draft RIA analysis considered a number of options potentially available to ComReg within the context of the RIA analytical framework as set out in the ComReg Guidelines (i.e. impact on consumers, impact on industry stakeholders and impact on competition).

That analysis was carried out in the context of the RIA analytical framework. However, it necessarily also involved an analysis of the extent to which various options would serve to facilitate ComReg in achieving its statutory objectives in the exercise of its functions. In particular, it involved an analysis of the extent to which the various options would serve to promote competition, and enable ComReg to ensure that users would derive maximum benefit in terms of choice, price and quality, to ensure that there would be no distortion or restriction of competition in the electronic communications sector, whilst at the same time encouraging efficient investment in infrastructure and promoting innovation.

ComReg has also, separately, considered each of these options with regard to particular statutory objectives, criteria and Policy Directions. This chapter sets out a summary of relevant objectives and Policy Directions generally, and, further, analyses, to the extent not already dealt with as part of the Draft RIA, whether, and to what extent, the various options would appear to meet those objectives, criteria and/ore Directions. As will be seen below, there has been a particular focus on the objective of ensuring the efficient management and use of spectrum in accordance with the Policy Directions, and the criterion of regulatory certainty.

For the purposes of this chapter, the various options will generally be grouped in the same manner as in the Draft RIA, with reference to the categories of options set out in Section 9.1.2. This will include reference to and analysis of a proposal based upon the Director's Statement in ODTR 01/96, a summary of which is set out in Section 9.1.2**.** Such analysis is set out without prejudice to ComReg's view regarding the circumstances surrounding the ODTR's statement or the interpretation thereof and any views which ComReg may put forward regarding the legal effect (or otherwise) of the Director's Statement.

10.1 ComReg's Functions and Objectives in relation to Spectrum

The 2002 Act, the Framework and Authorisation Regulations, and the Wireless Telegraphy Acts set out, amongst other things, functions and objectives of ComReg that are relevant to this consultation. Apart from licensing and making regulations in relation to licences, these functions include the management of Ireland's radio frequency spectrum in accordance with ministerial Policy Directions under Section 13, which ComReg is to carry out effectively, and in a manner serving to ensure that the allocation and assignment of radio frequencies is based on objective, transparent, non-discriminatory and proportionate criteria.

ComReg's primary objectives in carrying out these functions in the context of electronic communications are to:

- promote competition[60];
- contribute to the development of the internal market[61];
- promote the interests of users within the Community[62]; and
- ensure the efficient management and use of the radio frequency spectrum in Ireland[63].

In relation to the objectives of the promotion of competition, contributing to the development of the internal market and promoting the interests of users within the Community, ComReg is obliged to take all reasonable measures which are aimed at achieving those objectives, including certain measures which are specified in the 2002 Act and these are dealt with within the discussion of each objective below.

The promotion of competition and users' interests, and the implications of the various options for these objectives, have (to the extent relevant to the current process) largely been dealt with within the preceding Section 9 and the Draft RIA and these will be dealt with first, and only in summary form, in this chapter.

In carrying out its functions, ComReg is required amongst other things, to:

(i) ensure that any measures taken by it are proportionate having regard to the objective of ensuring the efficient management and use of the radio frequency spectrum[64] (this has been taken into account in the context of the objective to encourage efficient use and ensure efficient management of spectrum);

(ii) have regard to international developments with regard to electronic communications networks and electronic communications services, associated facilities, postal services, the radio frequency spectrum and numbering (this has been taken into account in the context of Policy Direction 7 below)[65]; and

(iii) take the utmost account of the desirability that the exercise of its functions aimed at achieving its radio frequency management objectives does not result in discrimination in favour of or against particular types of technology for the provision of ECS[66].

[60] Section 12 (1)(a)(i) of the 2002 Act (No. 20 of 2002).

[61] Section 12 (1)(a)(ii) of the 2002 Act (No. 20 of 2002).

[62] Section 12(1)(a)(iii) of the 2002 Act (No. 20 of 2002).

[63] Section 12(1)(b) of the 2002 Act (No. 20 of 2002).

[64] Section 12(3) of the 2002 Act (No. 20 of 2002).

[65] Section 12(5) of the 2002 Act (No. 20 of 2002).

[66] Section 12(6) of the 2002 Act (No. 20 of 2002).

Separately, pursuant to the Framework Regulations, ComReg is obliged to promote the harmonisation of use of radio frequencies across the European Community and this will be considered within the discussion of the objective to contribute to the development of the internal market[67].

Regulation 11of the Authorisation Regulations also requires ComReg, without prejudice to Section 13 and 37 of the 2002 Act, to give due weight to the need to maximise benefits for users and to facilitate the development of competition, in circumstances where it proposes to issue, pursuant to its powers under the Act of 1926, licences for a particular class or description of apparatus for wireless telegraphy for the provision of an electronic communication network or service, and considers that the limit of such licences ought to be limited.

Finally, in Consultation 08/57, ComReg identified the provision of regulatory certainty as a factor to be taken into account in the context of the efficient use of spectrum and for the purpose of assessing the degree to which options contribute to minimising disruption to the efficient use of spectrum. As this potentially affects a number of ComReg's objectives, it is considered as a separate heading within this chapter.

10.2 Policy Directions

Section 12(3) of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources ("the Minister") as he or she considers appropriate to be followed by ComReg in the exercise of its functions. Section 10(1)(b) also requires ComReg, in managing the radio frequency spectrum, to do so in accordance with a direction of the Minister under Section 13 of the 2002 Act.

The Policy Directions which are most relevant in this regard include the following:

- **Policy Direction No.3 on Broadband Electronic Communication Networks**

The Commission shall in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.

- **Policy Direction No.4 on Industry Sustainability**

The Commission shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and

[67] Regulation 23(2) of the Electronic Communities (Electronic Communications Networks (Framework) Regulations 2003.

in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.

- **Policy Direction No.7 on Consistency with other Member States**
  The Commission shall ensure that, where market circumstances are equivalent, the regulatory obligations imposed on undertakings in the electronic communications market in Ireland should be equivalent to those imposed on undertakings in equivalent positions in other Member States of the European Community.

- **Policy Direction No.8 on Cost of Regulation**
  The Commission shall ensure that the costs incurred by it in effectively carrying out its functions in relation to the electronic communications market and the management of the radio frequency spectrum are minimised, consistent with best practice in other Member States of the European Community, and, subject to any different conditions that may exist, should not be out of line with the cost of regulation in such Member States.

- **Policy Direction No.11 on the Management of the Radio Frequency Spectrum**
  The Commission shall ensure that, in its management of the radio frequency spectrum, it takes account of the interests of all users of the radio frequency spectrum.

  Policy Direction 11 has been considered in Section 9 of this document in the context of the impact on users and will be further considered in this section in the context of the efficient use and effective management of spectrum. Policy Directions 3, 4, 7 and 8 will each be considered separately in this chapter.

10.3 Promotion of Competition

In the current context, section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the **promotion of competition**, including:

(i) ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality;

(ii) ensuring that there is no distortion or restriction of competition in the electronic communications sector;

(iii) encouraging efficient investment in infrastructure and promoting innovation, and

(iv) encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources.

The extent to which each option meets the sub-criteria set out at paragraphs (i) to (iv) above have been considered in Section 9 in the context of the Draft RIA and so will not be repeated here, save that paragraph (iv) above will also be dealt with

under a general discussion in this section on ensuring the efficient management and use of spectrum.

10.4 Interests of Users

Section 12(2)(c) of the 2002 Act requires ComReg, when exercising its functions in relation to the provision of electronic communications networks and services, to take all reasonable measures which are aimed at the promotion of the interests of users within the Community, including:

(i) ensuring that all users have access to a universal service;

(ii) ensuring a high level of protection for consumers in their dealings with suppliers, in particular by ensuring the availability of simple and inexpensive dispute resolution procedures carried out by a body that is independent of the parties involved;

(iii) contributing to ensuring a high level of protection of personal data and privacy;

(iv) promoting the provision of clear information, in particular requiring transparency of tariffs and conditions for using publicly available electronic communications services;

(v) encouraging access to the internet at reasonable cost to users;

(vi) addressing the needs of specific social groups, in particular disabled users; and

(vii) ensuring that the integrity and security of public communications networks are maintained.

The impact of the various options on users from a more general perspective, and in the context of ComReg's objectives in the promotion of competition, has been considered in the preceding Section 9 in the context of the Draft RIA and it is not proposed to consider this further here. The majority of the measures set out above are, in ComReg's view, more relevant to the licence conditions to be imposed on any successful licensees, rather than the design of the award/assignment process, and will be discussed further in this context.

10.5 Contributing to the development of the internal market

Section 12(2)(b) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at contributing to the development of the internal market, including:

(i) removing remaining obstacles to the provision of electronic communications networks, electronic communications services and associated facilities at Community level;

(ii) encouraging the establishment and development of trans-European networks and

(iii) the interoperability of transnational services and end-to-end connectivity;

(iv) ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services and associated facilities; and

(v) co-operating with electronic communications national regulatory authorities in other Member States of the Community and with the Commission of the Community in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of Community law in this field.

The measures identified at (i), (ii) and (iv) above are, in ComReg's view, the most relevant in the context of the current process.

It is ComReg's view that full liberalisation of the 900 MHz spectrum band will contribute to removing obstacles to the provision of electronic communications networks, electronic communications services and associated facilities at Community level. This objective arguably falls within the aims of the Amending Directive, the purpose of which is to remove restrictions on the use of the 900 MHz band. The liberalisation of the 900 MHz band in Ireland will also assist in providing a level playing field which should encourage establishment and development of trans-European networks in accordance with (ii) above.

In this regard, the options set out in the Meteor proposal in response to Consultations 08/57 and 09/14, the Vodafone proposals in response to Consultations 08/57 and 09/14, the O2 response to 08/57 and Ericsson's proposal in response to Consultation 08/57 all provide for early liberalisation of the full band. Modified Option 1 also provides the opportunity for early liberalisation of the full band if Meteor opts for early release of its 2G licence spectrum.

On the other hand, ComReg's Option 2 and the option based on the Director's statement in ODTR 01/96 would involve the extension of licences which are limited to 2G use, and as such, obstacles may remain in place to the provision of services at a Community level. ComReg's Option 1 would lead to early liberalisation of spectrum apart from the spectrum covered by Meteor's licence which may not, under this option, be liberalised until 2015.

The options which involve administrative assignment of spectrum or retention of spectrum following a needs assessment by ComReg (e.g. Category 1 and 2 as identified in Section 9.1.5) arguably involve the granting of an advantage to the existing GSM licensees. ComReg has a concern that such options, particularly

those which involve the award of liberalised spectrum to existing GSM licensees without any competitive or comparative selection process, could constitute discriminatory treatment of undertakings by treating the existing GSM licensees differently to other operators. This is discussed in more detail in Section 9.1.5. This would seem to negate the benefits of these options in terms of early liberalisation as regards the contribution to the development of the internal market as potentially discriminatory treatment could hinder new entrants to the Irish market. Further, such options arguably do not encourage migration to 3G given the lack of incentives for the incumbents to compete. In fact, arguably the retention of spectrum based on demonstrable need, where there is ongoing review of continued retention requirements, creates incentives for operators not to migrate to 3G.

Modified Option 1 addresses this concern by ensuring that all spectrum is made available on a liberalised basis in a competitive process and as such, all operators have the same opportunity to acquire spectrum. Whilst there is some risk that Meteor may elect not to release spectrum early, all other spectrum would be auctioned for liberalised use from 2011 and there would be the possibility for Meteor's spectrum to also become available at that time.

10.6 Efficient Use and Management of Spectrum

It is one of ComReg's functions to manage the radio frequency spectrum in accordance with a Policy Direction under Section 13 of the 2002 Act. Policy Direction 14 requires ComReg to ensure that in managing spectrum it takes account of the interests of all users of the radio frequency spectrum. Further, in pursuing its objective to promote competition, ComReg must take reasonable measures to encourage efficient use and ensure efficient management of spectrum. Section 12(3) of the 2002 Act requires that measures taken with regard to ensuring the efficient use and effective management of spectrum must be proportionate.

10.6.1 Administrative Assignment of Spectrum

In light of ComReg's statutory functions and objectives and its obligations under the Authorisation Regulations, ComReg does not, as a general principle, consider that administrative assignment (such as reservation of spectrum or assignment of additional spectrum) is appropriate where demand is likely to exceed supply for particular spectrum.

The proposal for administrative assignment of spectrum to existing GSM licensees (in varying amounts and for varying proposed durations) is a common feature of a number of the potential options reviewed (Category 1 options). Similarly, a number of options involve the retention of spectrum by existing GSM licensees on a needs assessment basis (Category 2 options) which also involves an administrative assignment of spectrum.

While ComReg recognises that an administrative assignment of spectrum at existing levels and even additional administrative assignment of spectrum to existing GSM licensees would clearly be to their benefit, in ComReg's view such

an approach would not be in the interests of the efficient management and use of spectrum as, in a situation where demand exceeds supply, such an approach would not necessarily ensure that those who valued the spectrum the highest would obtain it. In particular, there would be a major cost to society associated with potentially assigning spectrum to the 'wrong' party through an administrative assignment, that is, a spectrum user who is not the best user of the spectrum for a period of time and/or incentivised to make best use of that spectrum. Absent disruptive new entry, there would be little incentive for existing GSM licensees to expedite the rollout of enhanced services.

It may be argued by some that any acquisition savings that may accrue to incumbents due to administrative assignment of spectrum (i.e. not having to 'buy' spectrum in an auction) could be invested in advanced new technologies. However, it is ComReg's view that the incentive for doing so is questionable absent the competitive discipline of market entry, the opportunity of which is significantly reduced in the event of administrative assignment.

10.6.2 Administrative Setting of Spectrum Fees

In addition, it is uncertain from most of the proposals involving a direct assignment of spectrum how spectrum usage fees would be determined for any administratively assigned spectrum. To the extent that these proposals would involve usage fee setting on an administrative basis, and noting ComReg's belief that such fees should be set having regard to the opportunity cost of this spectrum (particularly in light of the proposals suggesting that administratively assigned spectrum to existing GSM licensees be on a liberalised basis), ComReg considers that:

- there is no certainty that any administratively-set fee would be correct in terms of ensuring the efficient use of spectrum, particularly in present circumstances;

- a properly designed auction mechanism would most effectively and efficiently determine actual opportunity cost by obviating the need for determining the opportunity cost administratively without access to all of the relevant information; and

- administratively setting spectrum usage fees too low may well result in distortions to competition by inadvertently providing a further advantage to those to whom spectrum had been administratively assigned.

In this regard, ComReg recognises that there is no guarantee that any administratively-set fee would be capable of accurate or optimal calibration to ensure the efficient use of spectrum. Indeed, it seems more likely to be 'inaccurate' (particularly in present circumstances where there has yet to be a public award of liberalised 900 MHz spectrum by which to benchmark the value of same in Ireland).

10.6.3 Linking Spectrum Fees for Administrative Award to Auction

To the extent that any proposal in relation to the administrative award of spectrum to the existing GSM licensees, or retention of spectrum by GSM licensees, is linked to the subsequent auction of currently unassigned spectrum (for example, as in Vodafone's response to Consultation 09/14 and Vodafone's proposal as set out in 09/73), ComReg recognises that this would represent a positive move away from administrative pricing, towards market-based pricing of opportunity cost, particularly where the spectrum is being awarded or retained on a liberalised basis. Nevertheless, ComReg would raise the following concerns regarding this approach:

- the dynamics of a competition for part of the 900 MHz band would be different to the dynamics of a competition for the full band. For example, less spectrum to compete for, potentially different lot sizes (200 kHz as opposed to 5 MHz), some bidders having spectrum and having different incentives to bid for any extra spectrum. This could result in incorrect pricing of spectrum retained and lead to inefficient use of such spectrum (in addition to potential competitive distortions relative to those that had to compete at auction for spectrum);

- if a proposal is for spectrum to be priced appropriately, such as by fully reflecting the maximum value of the spectrum to an alternative user (e.g. the opportunity cost of next best user), then any spectrum retention by existing GSM licensees should not, in fact, provide any additional guarantee, relative to an auction-based assignment, that the incumbent 2G operators would retain the spectrum. This is because the price that these operators would have to pay to win the spectrum in an auction is precisely this opportunity cost, as expressed in the highest losing bid. Accordingly, this calls into question the basis for the retention of any spectrum post-licence expiry in 2011; and

- in light of these factors, and that the actual fee levied on incumbent GSM licensees would nevertheless be administrative in nature rather than purely determined at auction, ComReg considers that unnecessary risks arise from such a proposal in terms of potential challenge to the methodology/process used to set the fee as well as to the level of the fee itself.

ComReg is also cognisant of DotEcon's view that a properly designed auction mechanism, such as Modified Option 1, achieves an equivalent outcome to requiring the two operators to pay the opportunity cost in the form of an administrative charge if they wish to keep running 2G services beyond 2011, subject to their succeeding in the auction process, in their current spectrum allocations, while obviating the need to determine the opportunity cost administratively without access to all of the relevant information. In addition, ComReg notes that administratively setting spectrum usage fees too low may well result in distortions to competition by inadvertently providing a further advantage to those to whom spectrum had been administratively assigned.

10.6.4 Transparency and Costs of Needs Assessment

Certain of the proposals involve a needs assessment (the option based on the Director's statement in ODTR 01/96 and Vodafone's proposal in response to Consultation 09/14 as well as ComReg's Option 1 and UPC's proposal). Any needs assessment process envisaged under this proposal might not be sufficiently transparent or accurate, particularly as most, if not all, of the relevant information would be within the sole possession of the relevant operator. In such circumstances of information asymmetry, and given that part or all of that information would likely be commercially sensitive (and thus not available for public scrutiny – such as by other mobile operators who would be in a prime position to test the accuracy of this information), these factors may create the opportunity for the relevant operator to exaggerate the need to retain spectrum. The operator could have an incentive to do so if it felt that it could thereby retain spectrum at lower cost, with greater certainty, or to the detriment of rival operators. ComReg therefore recognises that conducting such an administrative process in such circumstances entails the real risk that more spectrum may be retained than is necessary and/or for a longer time than is necessary.

In addition, ComReg recognises the significant regulatory and monitoring burdens that would be incurred by both incumbents and ComReg in conducting reviews, which calls into question the regulatory efficiency of such a process[68].

10.6.5 Benefits of Competitive Allocation of Spectrum Band

A competitive allocation process for the entire spectrum band, on the other hand, such as contemplated in ComReg's Option 1 and UPC's Proposal, as well as Modified Option 1, would promote efficient use of spectrum by avoiding any cost to society associated with potentially assigning spectrum to the 'wrong' party through an administrative assignment, that is, a spectrum user which is not the best user of the spectrum for a period of time and/or incentivised to make best use of that spectrum. By doing so, it would ensure that consumers derive maximum benefit in terms of choice, price and quality of enhanced 3G services at the earliest opportunity.

These options would also avoid the use of any administrative assessment processes in relation to (a) the quantum of spectrum assignments (b) spectrum usage fees and (c) spectrum reorganisation. By avoiding the use of these processes, they would:

- remove the real risk under (a) that more spectrum may be retained than would be needed and/or for a longer time than was necessary. In addition, it would avoid the significant regulatory and monitoring costs, burdens and potential delays that would be incurred by incumbents, other operators and ComReg with a such process and thereby promote regulatory efficiency in relation to the management and use of spectrum;

[68] In this regard, ComReg has also had regard to Policy Direction 8 relating to the costs of regulation.

- remove the risk of improperly determining the level of spectrum usage fees (such as by benchmarking without access to all relevant information) and any potential detrimental consequences to efficient spectrum use (and competition); and

- remove the risk of unnecessary delays, poor outcomes and significant uncertainty that would otherwise be involved with an administrative process in relation to spectrum realignment.

10.6.6 Size of Spectrum Blocks

ComReg remains of the view that 2 × 5 MHz block sizes are the most efficient size for the current and future use of the band, and options based on award of 2 × 5 MHz block sizes maximise efficient outcomes at auction (in terms of simplifying the auction design, maximising the possibility of contiguous blocks of spectrum and minimising the risk of stranded and unused blocks)[69].

10.6.7 Assessment of Options

Based on the foregoing, ComReg would comment on the various potential options in terms of the efficient management and use of spectrum as follows:

(i) Meteor's Proposal in Response to Consultations 08/57 and 09/14 and Vodafone's proposal in response to Consultation 08/57

ComReg acknowledges that these options which extend existing 2G licences and provide for immediate liberalisation, would permit 2G licensees to deploy 3G services in parallel with existing 2G services.

In relation to Vodafone's proposal that any 2 × 10 MHz spectrum cap should be relaxed if there is no demand for the 2 × 5 MHz block not administratively assigned to existing GSM licensees, ComReg notes that, while all available evidence points to demand exceeding supply for liberalised 900 MHz spectrum, there may be some residual merit to this proposal.

However, for the reasons set out in 10.6.1 above, ComReg is of the view that such an administrative assignment of liberalised spectrum is not in the interests of efficient management and use of spectrum.

In relation to how the location of these administrative assignments would be determined, ComReg notes that Vodafone's proposal is silent on this issue and Meteor's proposal indicates a preference for any 2 × 10 MHz administratively assigned to incumbent GSM licensees to include their current assignments where possible. To the extent that these proposals would involve an administrative solution (such as a MoU or other form of inter-operator negotiation), then ComReg

[69] See Section 6.2.2 of Consultation 09/14.

recognises that such a process of re-alignment may lead to unnecessary delays, poor outcomes and significant uncertainty to the process[70] compared to a combinatorial auction mechanism that would permit operators to efficiently and effectively determine their location in the band by bidding to express their demand.

In addition, although Meteor's proposal refers to the possibility of subsequent release and reassignment of some of the spectrum administratively assigned to existing GSM licensees through a competitive award process, it does not indicate the timeframe within which the spectrum would be released, which would depend on the reduction in demand for 2G services. In this regard, ComReg notes that the penetration of 3G-capable handsets, 3G network infrastructure and the routing of subscriber traffic are factors which are largely under the control of the existing licensees. By extension these factors would influence the future demand for 2G services, and therefore the retention of spectrum dependent upon the decline of 2G service demand could create strong incentives for 2G operators to defer migrating consumers to 3G so as to retain any spectrum for as long as possible. Even after the natural decline of demand for GSM, operators may be tempted to prolong the provision of GSM services in order to prevent spectrum from being acquired by disruptive new entrants in an open competition. Indeed, ComReg recognises the strategic incentives of incumbent GSM licensees to tacitly coordinate in this regard.

Even if this should not be the case, then each operator is likely to experience different trends in the traffic profile of their customer base (as a result of the varying levels of capital investment and the particular demographics of their target market). The existing GSM licensees are hence likely to encounter differing levels of demand for legacy 2G services, resulting in differing dates of spectrum release which is unlikely to promote efficient spectrum use.

(ii) O2's proposal suggested in response to 08/57

Under this option, the use of a simultaneous auction with two stages (which would provide bidders with the ability to bid on a quantity of spectrum in the first stage, and the precise location of this spectrum in the second stage) would contribute to ensuring the efficient management and use of spectrum by allowing bidders the opportunity to obtain two contiguous blocks of spectrum in the bidder's preferred location in the band using efficient, transparent, market-based mechanisms.

It may be argued by some that reserving abstract lots of 2 × 7.5 MHz for existing GSM licensees would reduce the spectrum acquisition costs of incumbents and further that these savings could then be invested in deploying advanced new efficient services. However, the incentive for doing so is questionable absent the competitive discipline of market entry.

In any event, for the reasons set out in Section 10.6.1, ComReg's view is that such an administrative assignment of liberalised spectrum is not in the interests of efficient management and use of spectrum.

[70] As re-alignment of frequencies could incur costs by those operators that will be required to move within the band, there may be some reluctance or resistance to any administrative approach.

In terms of technical efficiency, as O2's proposal would involve auctioning of spectrum in lots of 2 × 2.5 MHz and while this would be advantageous to existing GSM licensees who would only require a single additional block to establish a 2 × 10 MHz presence in the band, it is inconsistent with the optimum block size for efficient deployment of 3G services as discussed in Section 10.6.6. Consequently, making spectrum available in un-aggregated lots of 2 × 2.5 MHz creates a risk of an auction resulting in stranded blocks of unused spectrum[71].

(iii) Ericsson's proposal in response to Consultation 08/57 and 09/14

This option involves the auction of spectrum in 2 × 5 MHz blocks. As noted at Section 10.6.6, 2 × 5 MHz block sizes are the most efficient for current and future use of the band.

In addition, all future licences in the 900 MHz band would be co-terminous (in 2030) thus removing the existing asymmetry in licence expiry dates.

It may be argued by some that reserving abstract lots of 2 × 5 MHz for existing GSM licensees would reduce the spectrum acquisition costs of incumbents and further that these savings could then be invested in deploying advanced new efficient services[72].

However, for the reasons set out in Sections 10.6.1 to 10.6.3, ComReg is of the view that such an administrative assignment of liberalised spectrum is not in the interests of efficient management and use of spectrum.

(iv) Vodafone's proposal as set out in 09/73

ComReg acknowledges that this option, which would extend existing licences and would provide for immediate liberalisation of the band, would permit 2G licensees to deploy 3G services in parallel with existing 2G services. The retention of spectrum post expiry would also increase certainty for incumbent licensees in the band. Furthermore, ComReg acknowledges that the defined release date of 2015 for some of the spectrum retained by incumbents would better promote regulatory certainty than an open ended release based on 2G service decline. In ComReg's view this would avoid perverse incentives for operators to defer the migration of consumers to advanced new services.

This option would also involve the auction of spectrum in 2 × 5 MHz blocks and, as noted at Section 10.6.6, 2 × 5 MHz block sizes are the most efficient for current and future use of the band.

[71] As ComReg noted at section 7.4.2 of Consultation 08/57, adopting a minimum block size of 2 × 5 MHz will reduce the risk of stranded spectrum and for this reason ComReg indicated its intention to adopt 2 × 5 MHz as the minimum block size at Section 6.2.2 of Consultation 09/14.

[72] Conventional economic analysis would suggest that in a competitive market, business decisions on matters such as network investment, product features and pricing are made by reference to the forward-looking profit-maximising level, not based on the historic 'sunk costs' associated with spectrum acquisition fees.

ComReg also notes that Vodafone proposes that the 2015 release of 2 × 15 MHz of 900 MHz spectrum from incumbent use would coincide with the release of spectrum in other bands, including any spectrum released as part of the "digital dividend". As discussed in Section 6.3 ComReg notes that the timeframe for release of "digital dividend" spectrum is not currently clear.

However, for the reasons set out in sections 10.6.1 to 10.6.3 above, ComReg is of the view that such an administrative assignment of liberalised spectrum or the retention of spectrum post expiry, is not in the interests of efficient management and use of spectrum.

ComReg also notes that two separate auctions are envisaged in this proposal, a consequence of which would be the impairment of bidding options and opportunities for participants to aggregate assignments. The effect of multiple auctions would also further stagger future expiry dates, and would necessarily entail two periods of spectrum realignment; the first of which would take place in 2010 when incumbent MNOs would have their respective assignments extended to 2 × 10 MHz and the latter in 2015 when each would release 2 × 5 MHz for auction.

More generally, this option would not provide early visibility of future assignments across the entire 900 MHz band for existing licensees and potential entrants to the band, in particular due to the uncertainty over the post 2015 assignment of 2 × 15 MHz released from incumbent use. This point is acknowledged by Vodafone in its own analysis of the proposal. Furthermore, it is perhaps worth noting that Vodafone argued against limiting the period of extension to 2015 on page 34 of its response to Consultation 09/14.

ComReg notes that Vodafone proposes an MoU to address the issue of spectrum realignment. As ComReg has noted earlier, an administrative approach based on a MoU, may lead to unnecessary delays, poor outcomes and significant uncertainty to the process compared to a combinatorial auction mechanism that would permit operators to efficiently and effectively determine their location in the band by bidding to express their demand.

Vodafone also suggests that incumbent MNOs should commit, in advance, to paying fees for administratively assigned spectrum and that the level of these fees would not be known at the time of assignment as they would be derived from a future auction outcome. In this regard, ComReg would refer to section 10.6.3 in relation to its concerns about such an approach to spectrum pricing.

(v) A proposal based upon the Director's Statement in ODTR 01/96 and Vodafone's proposal in response to Consultation 09/14

To the extent that these proposals would involve the auction of all unassigned spectrum in the 900 MHz band, including any spectrum not retained by Vodafone and O2 following any needs assessment (and any voluntary return of spectrum by Meteor or early liberalisation option for Meteor), this would contribute to efficient

spectrum use by ensuring that such spectrum is made available early in the process on a liberalised basis.

In addition, to the extent that these proposals would include regular review of any spectrum retained following the initial needs assessment, with the consequence of any spectrum not needed being returned and subsequently made available via a competitive allocation process, then this would also contribute to the efficient management and use of spectrum.

Under Vodafone's proposal, the immediate liberalisation of existing GSM assignments and any holdings post licence expiry would permit these licensees to deploy 3G services in parallel with existing 2G services (assuming sufficient spectrum was obtained at auction).

However, for the reasons set out at 10.6.1 to 10.6.4, ComReg does not consider that retention of spectrum on an administrative basis, even on the basis of a needs assessment, is in the interests of efficient management and use of spectrum.

Further, it is unclear how Vodafone's spectrum retention process would operate in practice, particularly in light of Vodafone's suggestion for the renewal of existing licences up until 2021 (or, ideally, indefinitely). For instance:

- would an assessment seek to determine spectrum retention until 2021 or indefinitely? In addition, would there be a single assessment or ongoing assessments?

- would Meteor be required to have its assessment conducted prior to a 900 MHz auction in 2010 for a period up to the expiry of its 3G licence or closer to expiry of its GSM licence (e.g. 2012/13)?

- whilst any spectrum not retained prior to the auction would be auctioned, what would happen with any spectrum no longer retained going forward (assuming an ongoing assessment of spectrum need). In this regard, would such spectrum be returned and subsequently auctioned in 200 kHz blocks?

In relation to spectrum realignment, Vodafone's proposal is silent on the mechanism by which the position of existing GSM licensee's 2 × 10 MHz administrative assignments would be determined. To the extent that these proposals would involve an administrative solution (such as a MoU or other form of inter-operator negotiation), then ComReg considers that such a process of re-alignment may lead to unnecessary delays, poor outcomes and significant uncertainty to the process[73] compared to an auction mechanism that would permit operators to efficiently and effectively determine their location in the band by bidding to express their demand. To the extent that this proposal would involve participation by incumbents in an auction, albeit on a partial basis, it is recognised that this proposal

[73] As re-alignment of frequencies could incur costs by those operators that will be required to move within the band, there may be some reluctance or resistance to any administrative approach.

could be modified to include participation in an assignment stage to overcome this particular issue.

ComReg would also draw attention to the serious technical deficiencies associated with a proposal based on auctioning block sizes of 2 × 200 kHz per lot. First, ComReg remains of the view that 2 × 5 MHz is the optimum block size as noted at Section 10.6.6. If Vodafone's proposal was adopted, ComReg considers that the use of 2 × 200 kHz block sizes would have considerable drawbacks from a spectrum efficiency perspective, including:

- the auction design for the award of unassigned 900 MHz spectrum would be substantially more complex, with the available spectrum being made available in 67 separate lots (assuming 2 × 13.4 MHz was available at auction). This would make the aggregation of lots extremely onerous and complex due to the numerous permutations of package bids and could lead to inefficiencies in spectrum use;

- there would be a heightened risk of stranded tranches of spectrum resulting from unaggregated 2 × 200 kHz lots which would in turn increase the likelihood of an inefficient auction and spectrum usage outcome;

- the 2 × 200 kHz wide guard-bands that lay between existing assignments in the band would only be of interest to existing licensees;

- there could be increased risk of a tacitly collusive or strategic behaviour between existing GSM licensees aimed at degrading the usefulness of spectrum awarded to other successful bidders, for example, where existing GSM licensees obtained contiguous blocks of 2 × 10 MHz assignments, but in a way that did not provide for the remaining 2 × 5 MHz to be contiguous.

To the extent that 2 × 5 MHz block sizes were used for the allocation of unused spectrum, then this would potentially overcome the above issues, but raise other issues of how uncertain and varying spectrum holdings of existing GSM licensees (due to eventual release of spectrum no longer required for GSM provision) would co-exist with multiples of 2 × 5 MHz block sizes for holders of liberalised licences.

(vi) ComReg's Option 2 and O2's proposal in response to Consultation 09/14

As these options would involve the auction of all unassigned spectrum in the 900 MHz band, including any spectrum not retained by Vodafone and O2 following any needs assessment (and any voluntary return of spectrum by Meteor in advance of the auction), this would contribute to efficient spectrum use by ensuring that such spectrum is made available early in the process on a liberalised basis.

In addition, as these options would likely include regular review of any spectrum retained following the initial needs assessment, with the consequence of any spectrum not needed being returned and subsequently made available via a

competitive allocation process, then this would also contribute to the efficient management and use of spectrum.

These options would further contribute to ensuring the efficient management and use of by using 5 MHz block sizes, which is the most efficient size for the current and future use of the band as set out in Section 10.6.6.

However, for the reasons set out at Sections 10.6.1 to 10.6.4, ComReg does not consider that retention of spectrum on an administrative basis, even on the basis of a needs assessment, is in the interests of efficient management and use of spectrum

These options would not provide early visibility of future assignments of the entire 900 MHz band for existing licensees and potential entrants to the band, in particular due to the uncertainty of:

- when spectrum would be returned by existing GSM licensees following any needs assessment;
- whether any spectrum so returned would form a 2 × 5 MHz block;
- any measures ComReg may take to ensure that spectrum so returned was in a certain position in the band (e.g. a preference for spectrum in Block F in relation to any spectrum returned by Vodafone and O2); and
- when it would subsequently be made available.

In relation to spectrum realignment, to the extent that both options would involve an administrative solution (such as a MoU or other form of inter-operator negotiation), ComReg considers that such a process of re-alignment may lead to unnecessary delays, poor outcomes and significant uncertainty to the process[74] compared to an auction mechanism that would permit operators to efficiently and effectively determine their location in the band by bidding to express their demand.

Any spectrum holdings retained by existing GSM licensees for the purposes of addressing any likely disruption to 2G consumer services would be restricted to GSM use only[75]. Under this proposal, the full 900 MHz band would not be liberalised until 2015 at the earliest, thus delaying the technical efficiencies, consumer gains and other benefits associated with full liberalisation.

[74] As re-alignment of frequencies could incur costs by those operators that will be required to move within the band, there may be some reluctance or resistance to any administrative approach.

[75] This position is informed by the potential distortion to competition should existing GSM licences be liberalised (in light of asymmetries in mobile spectrum holdings between existing MNOs) in advance of a competitive award process that would provide non-discriminatory access to liberalised spectrum. This includes potential distortions of a substantive and temporal nature.

(vii) ComReg's Option 1, UPC's proposal in response to Consultations 08/57 and 09/14 and Digiweb's Proposal in response to Consultation 09/14

A simultaneous auction of the entire band, with allocation of spectrum being staggered to reflect existing expiry of GSM licences would make the maximum amount of liberalised spectrum available at one point in time as soon as possible thus creating early visibility of future assignments in the band. It also avoids the difficulties associated with administrative award or retention of spectrum as set out in Section 10.6.5.

In addition, the use of a simultaneous auction with two stages (which would provide bidders with the ability to bid on a quantity of spectrum in the first stage, and the precise location of this spectrum in the second stage) would contribute to ensuring the efficient management and use of spectrum by allowing bidders the opportunity to obtain two contiguous blocks of spectrum in the bidder's preferred location in the band using efficient, transparent, market-based mechanisms.

Option 1 would also contribute to ensuring the efficient management and use of spectrum by using 5 MHz block sizes, which is the most efficient size for the current and future use of the band as set out at Section 10.6.6. In addition, all future licences in the 900 MHz band would be co-terminous (expiring in 2030) thus removing the existing asymmetry in licence expiry dates.

However, although Option 1 would provide the opportunity for 5 out of the 7 blocks to be liberalised by 2011, liberalisation of the entire band would not materialise until 2015 due to the staggered availability of liberalised spectrum, in line with the expiry dates of GSM licences.

Under UPC's option, the effect of reserving blocks A and B for a new mobile entrant could, in ComReg's view, be detrimental to the most efficient outcome by removing competition from existing GSM licensees for these blocks and thus risking that those who may value the spectrum most highly will not obtain it and be incentivised to make efficient use of that spectrum.

In relation to UPC's preference for a beauty contest by which to assign spectrum, ComReg welcomes UPC's view that a competitive assignment mechanism is appropriate in present circumstances. While a beauty contest involves the objective evaluation of alternative bids for spectrum against objectively justified, transparent, non-discriminatory and proportionate selection criteria, due to the highly valued nature of this spectrum, ComReg recognises the increased opportunity for unsuccessful applicants in a beauty contest to seek to frustrate or delay an outcome considered to be unfavourable through litigation (such as claims of perceived bias etc), when compared to a auction mechanism (other things being equal) and thus the increased risk of delay to the liberalisation of the band. An auction-based clearing mechanism provides additional neutrality and clarity which would be of assistance in this case. Of course, this does not mean that ComReg will not use comparative selection procedures in the future where it is more appropriate to do so.

(viii) Modified Option 1

A simultaneous auction of the entire band along with the early release option for Meteor, with allocation of spectrum being staggered to reflect existing expiry of GSM licences, would make the maximum amount of liberalised spectrum available at one point in time as soon as possible, thus creating early visibility of future assignments in the band and removing any artificial scarcity. It also avoids the difficulties associated with administrative award or retention of spectrum as set out at Section 10.6.5.

In addition, the use of a simultaneous auction with two stages (which would provide bidders with the ability to bid on a quantity of spectrum in the first stage, and the precise location of this spectrum in the second stage) would contribute to ensuring the efficient management and use of spectrum by allowing bidders the opportunity to obtain two contiguous blocks of spectrum in the bidder's preferred location in the band using efficient, transparent, market-based mechanisms.

This option would also contribute to ensuring efficient management and use of by using 5 MHz block sizes, which is the most efficient size for the current and future use of the band as set out at Section 10.6.6.

In addition, all future licences in the 900 MHz band would be co-terminous (expiring in 2030) thus removing the existing asymmetry in licence expiry dates.

Further, Modified Option 1 provides the opportunity for the entire band to be liberalised in 2011, by providing an option for the early release of spectrum by Meteor, and thus maximising the potential for efficient spectrum use (via the deployment of efficient 3G technologies) and the consumer benefits that would flow.

In ComReg's view, Modified Option 1 addresses most, if not all, of the issues in relation the efficient management and use of the radio spectrum raised by respondents.

The one potential disadvantage is that although the early release option maximises the potential for complete liberalisation of the band in 2011, it is recognised that there is some potential for inefficiency in the short term, depending on whether Meteor chooses to avail of the opportunity for early release. Regardless of whether or not Meteor avails of this opportunity, the entire band would be liberalised by 2015.

10.7 Rollout of Broadband (Policy Direction 3)

ComReg is required, pursuant to Policy Direction No.3, in the exercise of its functions, to take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always on broadband infrastructure and services for businesses and

citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.

Advanced wireless networks (especially in the 900 MHz band) offer the ability to deliver wide area broadband with almost universal broadband coverage.

Availability of liberalised access to 900 MHz spectrum, while paying fees that represent the usage value of advanced services in this spectrum, would appear to be the most effective means of incentivising licensees to transition to such networks at the earliest possible date. Such access is therefore supportive of widespread availability of affordable broadband.

In this regard, the options set out in the Meteor proposal in response to Consultations 08/57 and 09/14, the Vodafone proposals in response to Consultations 08/57 and 09/14 and as set out in 09/73, the O2 proposal in response to 08/57 and Ericsson's proposal in its response to Consultation 08/57 all provide for early liberalisation of the full band. Modified Option 1 also provides the opportunity for early liberalisation of the full band if Meteor opts for early release of its 2G licence spectrum.

However, there is a difficulty with setting the fees for any administrative assignment or retention of spectrum at a level which values the usage of this spectrum for advanced services, as has been discussed in more detail in Section 10.6.

On the other hand, ComReg's Option 2 and the option based on the Director's statement in ODTR 01/96 would involve the extension of licences which are limited to 2G use, as discussed in more detail in Section 10.6. ComReg's Option 1 would lead to early liberalisation of spectrum apart from the spectrum covered by Meteor's licence which may not, under this option, be liberalised until 2015.

Further, the options involving administrative assignment (Category 1) and/or retention of spectrum on a needs assessment (Category 2) arguably do not encourage migration to advanced services given the lack of incentives for the incumbents to compete (as discussed further in Section 10.6). In fact, the retention of spectrum based on demonstrable need, where there is ongoing review of continued retention requirements, may create incentives for operators not to migrate to 3G and to exaggerate the need to retain spectrum for 2G use.

In its response to Consultation 09/14 Meteor expressly raised the National Broadband Scheme contract obtained by H3GI and states that this should be taken into account. See Section 6.9 of this document for ComReg's view of this issue.

Additionally it is possible that a disruptive new entrant might concentrate on the provision of ubiquitous broadband and perhaps choose not to provide any voice services. Such an entrant might compete aggressively in this space. ComReg's view is that it should not artificially constrain this possibility but rather allow for it as a possible outcome of market-driven processes. The options involving

administrative assignment of spectrum would weigh against a new disruptive entrant to the market.

Proposals contained in some of the options put forward for the auction of blocks of 200 kHz (Option based on the Director's Statement in ODTR 01/96 and Vodafone's proposal in response to Consultation 09/14) or 2.5 MHz (O2's response to Consultation 08/57) are potentially incompatible with the advanced services envisaged in the EC Decision and could militate against the provision of such advanced services.

It should be noted that the Ericsson response to 09/14 proposed the inclusion of a latency requirement in any broadband conditions. This appears to be an entirely sensible condition.

10.8 Industry Sustainability

This Policy Direction is addressed in the context of the draft RIA in Section 9 of this document.

10.9 Consistency with other Member States (Policy Direction 7)

Policy Direction No.7 requires ComReg to ensure that, where market circumstances are equivalent, the regulatory obligations imposed on undertakings in the electronic communications market in Ireland should be equivalent to those imposed on undertakings in equivalent positions in other Member States of the European Community.

Further, ComReg is obliged, pursuant to Section 12(5) of the 2002 Act to have regard to international developments.

ComReg has, throughout the current consultation process, had constant regard to international developments, including developments in other Member States. In this regard ComReg would refer to Annex E to Consultation 08/57, Annex C to Consultation 09/14 and to Section 4 above.

ComReg would not consider that it is obliged, pursuant to Policy Direction No.7, to implement a process which is *identical* to other Member States. As noted in Section 4 above, ComReg must take care, whilst seeking to maintain consistency with other Member States, to ensure that any measures it takes are suited to the particular features of the Irish market and on balance, ComReg considers that a competitive auction process is the best means of achieving its objectives in the Irish market.

ComReg notes that a competitive auction process is, in fact, being adopted by a number of European national regulatory agencies (NRAs) including Germany, the Netherlands, Belgium and Switzerland, including in relation to 900 MHz and 1800 MHz spectrum.

10.10 Regulatory Certainty

As noted above in Consultation Paper 08/57, ComReg identified the provision of regulatory certainty as a factor to be considered in the context of efficient management and use of spectrum. This is also relevant in the context of other objectives, including, for example, ComReg's objective to promote competition, insofar as ComReg is required to take reasonable measures to ensure efficient investment and promote innovation.

10.10.1 Administrative Assignment

A number of the potential options under consideration involve the administrative assignment of spectrum (in varying amounts and for varying durations) directly to existing GSM licensees. ComReg recognises that existing GSM licensees would contend that administratively assigning spectrum to them would provide them with regulatory and/or investment certainty by eliminating the risk of them losing access to any 900 MHz spectrum.

However, in ComReg's view, the administrative assignment of spectrum in circumstances where demand is likely to exceed supply for such spectrum would have serious detrimental consequences for regulatory certainty and Ireland's regulatory reputation. In particular, ComReg considers that such an approach would:

- undermine regulatory certainty by creating poor incentives for those recipients to make the most efficient use of spectrum (such as migrating customers to newer services) as, by granting the assignment on the basis of incumbency (or protection of a legacy situation) then such recipients would likely be incentivised to prolong or protract the legacy situation so as to hold onto the spectrum for as long as possible – particularly where access to such spectrum provides a strategic competitive advantage (e.g an effective barrier to entry to a market or significant cost, revenue or other advantage);

- decrease regulatory certainty about licence expiry and subsequent availability to other users of spectrum – including existing competing economic operators without this spectrum or potential entrants - in the relevant spectrum band and potentially more broadly. With regards to the latter, ComReg notes that there are many classes of Wireless Telegraphy licences in Ireland which have explicit/fixed licence durations/expiry dates and, in these circumstances, it is critical for industry regulatory certainty for ComReg to apply, and be seen to be applying, an open, transparent, and non-discriminatory approach to access to spectrum; and

- diminish regulatory certainty for any prospective new entrant to the Irish market and likely deter future investors who may view ComReg as being protectionist in relation to incumbent operators.

10.10.2 Competitive Auction of Entire Spectrum Band

A competitive auction of the entire spectrum band, as contemplated in ComReg's Option 1 and UPC's proposal, as well as in Modified Option 1, would use open, fair, transparent and non-discriminatory spectrum allocation mechanisms, which would, in ComReg's view:

- promote regulatory certainty by incentivising winners of spectrum in a competition to make the most efficient use of that spectrum;
- promote regulatory certainty about licence expiry and subsequent availability to other users of spectrum – including existing competing economic operators without this spectrum or potential entrants - in the relevant spectrum band and potentially more broadly; and
- promote regulatory certainty for any prospective new entrant to the Irish market and incentivise future investors by demonstrating Ireland's commitment to the principles of, and its obligations in relation to, non-discrimination, fairness, proportionality and/or reasonableness in its spectrum assignment processes.

Similarly, by avoiding the use of administrative mechanisms in relation to (a) the quantum of spectrum assignments (b) spectrum usage fees and (c) spectrum reorganisation it would remove the risk of unnecessary delays, poor outcomes and uncertainty that would be involved with such processes.

10.10.3 Assessment of Options

(i) Meteor's proposal in response to Consultations 08/57 & 09/14 and Vodafone's proposal in response to Consultation 08/57

For the reasons set out in Section 10.10.1, ComReg does not consider that the administrative assignment of spectrum of this nature would provide regulatory certainty.

Under this option there may be delays associated with administratively determining (a) spectrum usage fees associated with these administrative assignments and/or (b) location of these administrative assignments in the band, which may delay the release of liberalised spectrum.

In addition, the open-ended nature of spectrum retention/release based on 2G service decline under Meteor's proposal is inherently uncertain, particularly in light of the ability of and incentive for each of the existing GSM licensees to delay migration and thus retain spectrum for as long as possible. In effect, the efficient management of the 900 MHz band would be placed in the control of these licensees and for strategic reasons, the licensees might not achieve the desired efficiencies in terms of managing the 900 MHz band. In this context, ComReg does not consider

that it would be meeting its obligations to ensure the efficient management of spectrum and provide regulatory certainty to other potential users of the spectrum.

(ii) O2's proposal suggested in response to 08/57

For the reasons set out in Section 10.10.1 ComReg does not consider that the administrative assignment of spectrum of this nature would provide regulatory certainty.

(iii) Ericsson's proposal in response to Consultations 08/57 and 09/14 and Vodafone's proposal as set out in 09/73

For the reasons set out in Section 10.10.1, ComReg does not consider that the administrative assignment of spectrum of this nature would provide regulatory certainty.

(iv) A proposal based on the Director's statement in ODTR 01/96 and Vodafone's proposal in response to Consultation 09/14

For the reasons set out in Section 10.10.1, ComReg does not consider that the administrative assignment of spectrum of this nature would provide regulatory certainty.

Under this option, there may be delays associated with administratively determining (a) the amount of spectrum retained (b) the spectrum usage fees associated with these administrative assignment and/or (c) location of these administrative assignments in the band which may delay or create uncertainty about the release of liberalised spectrum.

(v) ComReg's Option 2 and O2's proposal in response to Consultation 09//14

For the reasons set out in Section 10.10.1, ComReg does not consider that the administrative assignment of spectrum of this nature would provide regulatory certainty.

Further, under this option, to the extent that spectrum fees would be administratively determined, then delays associated with such a process may delay the release of liberalised spectrum to the market.

In addition, these proposals are unlikely to create regulatory certainty for potential entrants, and would only provide limited regulatory or investment certainty to Vodafone and O2 for a period of 4 years. The following factors would be likely to adversely affect certainty for interested parties:

- postponing an auction of the band in order to evaluate the merits of relevant incumbent GSM licensees' applications for spectrum retention, and conduct the administrative spectrum usage fee-setting process, would inevitably delay stakeholders visibility of future assignments in the band;

- O2 and Vodafone would, if their claims are to be believed, face the same level of uncertainty in 2015 when they reach the limit of permissible spectrum retention under these proposals; and

- if granted extensions up to 2015, then all three GSM operators would face simultaneous expiry of 900 MHz and 1800 MHz licences and, in such circumstances, ComReg recognises the incentives of these operators to make further claims for spectrum retention.

(vi) ComReg's Option 1, UPC's proposal in response to Consultations 08/57 and 09/14, and Digiweb's proposal in response to Consultation 09/14

For the reasons set out in Section 10.10.2, ComReg considers that this option would contribute to providing regulatory certainty and avoids the difficulties associated with administrative assignment.

Option 1 provides early visibility of future assignments of the entire 900 MHz band for existing licensees and potential entrants to the band. Existing 900 MHz licensees and potential entrants would be made aware of future block assignments in 2010 for the full 900 MHz band, one year ahead of the expiry of existing licences in 2011 and four years in advance of the last GSM licence expiry in 2015. This would provide visibility on licensing within the band until 2030 when all licences expire.

UPC did not appear to provide objective justification for its proposal to exclude existing GSM licensees from participating in an auction for currently unassigned spectrum. Whilst ComReg understands UPC's interest in promoting greater access to the 900 MHz band, it does not support doing so in a manner that would be discriminatory to existing GSM licensees and may impact on their ability and incentive to compete and secure investment in future network upgrades[76]. Besides being a statutory obligation, it should be apparent why the principle of ensuring equal opportunities to obtaining spectrum is a cornerstone of ComReg's approach to spectrum management and also why the use of open, transparent competitive assignment procedures (and criteria where relevant) is critical to providing such opportunities, particularly in cases of spectrum scarcity.

(vii) Modified Option 1

For the reasons set out in Section 10.10.2, ComReg considers that this option would contribute to providing regulatory certainty and avoids the difficulties associated with administrative assignment.

This option provides early visibility of future assignments of the entire 900 MHz band for existing licensees and potential entrants to the band. Existing 900 MHz licensees and potential entrants would be made aware of future block assignments

[76] Noting, where relevant, Recital 23 of the Authorisation Directive.

in 2010 for the full 900 MHz band, one year ahead of the expiry of existing licences in 2011 and four years in advance of the last GSM licence expiry in 2015. This would provide visibility on licensing within the band until 2030 when all licences expire.

This option would uphold Meteor's existing rights and obligations while also offering the opportunity for the entire band to be liberalised without creating potential market distortions to either existing licensees or other operators.

11 ComReg's Proposed Approach and Auction Format

This section sets out ComReg's proposed approach to the future licensing of the 900 MHz band in Ireland and its reasons for same.

In determining its current position on the future licensing of the 900 MHz band, ComReg has carefully considered and had regard to the information at its disposal, including, without limitation, the responses to Consultations 08/57 and 09/14, the bilateral meetings with respondents, and the expert reports that it has commissioned during the process in the context of the regulatory framework within which ComReg must operate.

ComReg believes that there is no option available that will completely satisfy all stakeholders and be compatible with the statutory framework within which its decisions must be made. However, ComReg believes that, based on the analysis of the different options considered in the context of the RIA analytical framework and bearing in mind relevant criteria, including its statutory objectives and Policy Directions made by the Minister under Section 13 of the 2002 Act (see Section 9) and evaluated against particular statutory objectives, criteria and Policy Directions (see Section 10), on balance, Modified Option 1 (as set out in the DotEcon report and summarised in Section 8.2) is the best available approach.

Bearing in mind the draft nature of the RIA and subject to the possibility of modification following this consultation, ComReg currently proposes to proceed with the establishment of a competitive award process based on Modified Option 1.

In this regard, the ensuing sections of this document set out, in draft detail, how ComReg proposes to implement Modified Option 1 subject to any final substantive observations arising from this consultation.

12 ComReg's Proposed Auction Format

In light of ComReg's selection of Modified Option 1 as the option that would best meet its statutory functions, duties and objectives in relation to the future licensing of the 900 MHz band, it is now necessary to consider and determine the characteristics of the auction that would best give effect to this option.

In this regard, this section discusses the following key issues:

- consideration of the applicability of the available auction formats in the context of the particular characteristics of Ireland's 900 MHz band;
- consideration of an auction mechanism to deal with the asymmetry in GSM 900 MHz licence expiry dates (i.e. 2011 and 2015); and
- consideration of an auction mechanism that would facilitate the full liberalisation of the band as soon as possible.

12.1 Objectives for a Candidate Auction Format

At a high level, the ideal auction format will be the one which best meets ComReg's statutory functions, duties and objectives which have been outlined in Sections 9 and 10.

In addition, the auction format adopted must comply with the following obligations upon ComReg in relation to the issue of licences pursuant to its powers under the Wireless Telegraphy Act 1926 (as amended):

- to ensure that the allocation and assignment of radio frequencies is based on objective, transparent, non-discriminatory and proportionate criteria: Regulation 23(1) of the Framework Regulations;
- to establish open, transparent and non-discriminatory procedures for the granting of licences under the Act of 1926: Regulation 9 of the Authorisation Regulations; and
- when proposing to issue licences under the Act of 1926, where ComReg considers that the number of such licences ought to be limited, to, amongst other things:
    - give due weight to the need to maximise benefits for users and facilitate competition;

- consult and provide reasons for any decision to limit the granting of a licence[77]; and

- grant such licences on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate and which give due weight to the achievement of ComReg's objectives set out in section 12 of the 2002 Act and Regulation 11 of the Authorisation Regulations.

Furthermore, as a result of this consultation process and ComReg's consideration of the various options, it is ComReg's view that any award process should provide for the following key features:

- to facilitate the obtaining of contiguous assignments as this would allow licensees to minimise the number of internal guard bands required in the band and thus maximise spectrum utilisation (see Section 6.2.3 of Consultation 09/14);

- facilitate the co-termination of future licences issued so as to reduce the potential for future distortions to competition that may arise from this particular asymmetry;

- spectrum would be assigned in 2 × 5 MHz blocks (see Section 6.2.2 of 09/14); and

- that an auction spectrum cap of 2 × 10 MHz per operator will apply (see Section 6.2.1 of 09/14), unless demand does not, at auction, exceed supply. However and in order to ensure a robust process in the event that demand does not exceed supply ComReg is minded to relax the auction spectrum cap and accept bids up to 2 × 15 MHz, as suggested by one respondent;

In its report, DotEcon notes that it has had regard to ComReg's various objectives and obligations in developing its report. In addition, DotEcon sets out, at Section 6.1 of its report, its objectives in relation to the determination of the auction format.

After due consideration of DotEcon's stated objectives, ComReg is of the view that they are appropriate in the context of ComReg's statutory objectives and obligations, and also have sufficient regard to the parameters and other circumstances of this particular spectrum release.

For ease of reference, the auction format objectives set out by DotEcon are as follows:

[77] In the present case, the combination of the most efficient block size of 2 × 5 MHz (see Section 6.2.2.1 of Consultation 09/14 for ComReg's reasons for its position in this regard) and a total of 2 × 35 MHz in the 900 MHz band means that the number of possible 900 MHz licences is necessarily limited to seven. As ComReg has consulted on the most efficient block size, and given the finite nature of spectrum in the 900 MHz band, ComReg considers that it has properly discharged its obligations in relation to this obligation.

- as well as promoting high-value broadband services, the auction outcome must allow for a smooth transition of spectrum use from GSM to 3G services, such that existing GSM services are not terminated too quickly and undue disruption to consumers is avoided. This requires the coexistence of different technologies with an efficient assignment of frequencies to minimise interference costs (i.e. the costs involved in mitigating interference) to other licensees. The proposed lot design discussed in Section 12 of this document already goes a long way to facilitating coexistence of different technologies;

- the auction format and rules should minimise the risk of undesirable assignment outcomes for bidders seeking multiple 2 × 5 MHz lots on a contiguous basis. Therefore, the format should mitigate both:

  - aggregation risks, that is, where a bidder requires multiple blocks of spectrum but is awarded 'stranded' licences (unwanted subsets of demand, one 2 × 5 MHz block where a bidder sought two blocks in this case); and

  - fragmentation risks, that is where a bidder wins two 2 × 5 MHz blocks that are not contiguous, which might significantly reduce the bidder's value of the spectrum;

- where relevant, the auction process should try to minimise common value uncertainty[78], which may exist where bidders use the available spectrum to deploy new technologies;

- the allocation process should aim to minimise migration costs, thus minimising the outcomes where bidders might be unnecessarily awarded different frequency blocks over time;

- the auction should avoid outcomes where spectrum goes unsold despite there being demand for that spectrum;

- the auction should encourage participation in the process, and mitigate concerns about bidder asymmetries both between the incumbent operators and between incumbents and potential entrants;

- the auction should promote incentives for bidders to bid in a straightforward manner, and not to engage in strategic behaviour or tacit collusion;

- the auction should provide a high level of clarity and certainty for bidders as to the level of expenditure that they are liable for as a result of the bids that they place; and

[78] Common Value Uncertainty is unknown factors common to all bidders, such as unknown technical or market factors.

- the auction process should be simple and transparent to bidders.

12.2 Auction Format

12.2.1 Selection of an Auction Format

DotEcon identified and examined the following four potential candidate auction formats:

- Standard simultaneous multiple-round ascending (SMRA) auctions;
- SMRA auctions with augmented switching (SMRA/AS);
- Combinatorial clock auctions (CCA); and
- Sealed-bid combinatorial (SBC) auctions.

It is not proposed to fully repeat DotEcon's discussion and analysis of these formats. Stakeholders are advised to carefully review the mechanics of each of these auction formats and the advantages and disadvantages of each in relation to DotEcon's stated objectives for the auction format (set out in sections 6.2 to 6.6 of the DotEcon Report).

In light of its analysis of the different formats, DotEcon is of the view that a combinatorial auction is the ideal in present circumstances. Its main reason for this recommendation is that in the context of the present award, the use of a combinatorial format provides the particular advantages of a solution to the problem of aggregation and fragmentation risks that arise with the more traditional SMRA and its variants.

The following table provides a summary of these findings (and should be read in conjunction with the analysis set out in the relevant chapters of the DotEcon Report).

Factor	SMRA	SMRA/AS	CCA	SBC
Allows for coexistence of different technologies with minimal interference costs	X	X	√	√
Minimises aggregation risks	X	X	√	√
Minimises fragmentation risks	-	√	√	√
Reduces common value uncertainty	√	√	√	X
Minimises migration costs	X	X	√	√
Ensures a competitive outcome (at least 4 winners with at least 2 × 5 MHz each)	Depends on the spectrum packaging used, the spectrum caps set on bidders, and whether any spectrum is reserved for entrants.			
Avoids unsold lots where there is demand for these	X	X	√	√
Encourages participation	-	-	√	√
Promotes straightforward bidding	X	X	√	√
Clarity and certainty on amount of committed expenditure	√	X	√	√
Simplicity and transparency of the process (a lack of transparency here relates to the value of the bids of other bidders)	√	-	X	X

Table 4: Summary of the Advantages and disadvantages of the candidate auction formats (Source: DotEcon Section 6.6)

In summary, a combinatorial auction would involve a two stage process as follows:

First stage

The first stage would determine the number of generic 2 × 5 MHz lots won by each bidder and the price by allowing bidders to bid for a certain number of generic lots. Winners would be chosen to maximise the total value of winning bids, subject to not awarding more lots than the number of lots available and maintaining the spectrum cap. If demand does not exceed supply then all bids in the first stage are won at the reserve price.

Prices for winners in the first round would be determined using a second price rule – where the winner would pay the amount bid by highest paying losing bidder, rather than what the bidder had bid him/herself (in effect, the opportunity cost of the winning bid). In DotEcon's view, the second price rule would provide

reasonable incentives for bidders to bid close to their true values for packages of lots.

Second stage

Given the outcome of the first stage, ComReg would be in a position to determine all the feasible frequency locations for winning bids on the basis that all winning multiple lots will be assigned contiguous spectrum.

The second stage would then determine which exact spectrum is allocated to winners (that is, the location in the frequency band), by allowing winners in the first stage to make bids for the lots they have won, to be located at various specific frequencies. This is known as the assignment stage.

Winners would be located to specific frequencies to maximise the value of their accepted second stage bids. Prices are determined in a similar manner to the first stage (i.e. a second price rule based on opportunity costs) in order to avoid incentives to bid less than true values. It is not mandatory for any successful first stage bidder to bid in the second stage if they place no value on their actual location in the band (ComReg acknowledges that this is not particularly realistic in this case given that different blocks become available at different times due to differing licence expiry dates).

ComReg agrees with DotEcon's view that the SMRA auction types would not be suited to the particular issues entailed in the present spectrum award. In particular:

- should bidders wish to bid for two 2 × 5 MHz blocks (the amount of spectrum required to maintain legacy GSM services and deploy UMTS), the efficiency and desirability of such an assignment hinges on these 2 × 5 MHz spectrum blocks being located in adjacent spectrum. This is not ensured by the SMRA auction formats;

- achieving auction outcomes where the winner's resulting spectrum assignments are contiguous is further complicated in this case where different parts of the 900 MHz band are to be licensed for use from different dates (in light of the different expiry dates of existing licences), and an overall spectrum cap applies making some licences more attractive than others to existing operators in the band; and

- it is possible that a bidder could value 2 × 10 MHz of spectrum at more than twice 2 × 5 MHz of spectrum. In this case, bidders would face aggregation risks if a more traditional SMRA is used.

As a result of these concerns about aggregation risks, it is not surprising that a number of regulators have adopted combinatorial auction formats in recent times. Indeed, it is for these reasons that ComReg adopted the two stage combinatorial format in the 26 GHz auction design.

In light of the above, ComReg agrees with DotEcon's recommendation that an auction format that allows for package bidding (the CCA or sealed-bid combinatorial format) in order to reduce the possibility of fragmented outcomes and to eliminate aggregation risks should be used. Therefore, and after having given the matter careful consideration, ComReg is minded to proceed with a combinatorial auction format, as such a format, which includes package bidding and an optimal grouping of lots into generic categories, would enhance the efficiency of the auction process.

12.2.2 Selecting Between Combinatorial Formats

Having considered that a combinatorial auction would be the most appropriate auction format in present circumstances, it is necessary to identify the particular type of combinatorial auction. The options available to ComReg in this regard are a combinatorial clock auction (CCA) or a sealed-bid combinatorial auction.

The main difference between the two options centres upon the issue of price discovery and whether a price discovery stage would be desirable in present circumstances. This issue is analysed by DotEcon in Section 8.1 of its report.

In summary, allowing price discovery at an auction stage is advantageous when there may be "common value uncertainty" amongst bidders as to the underlying value of the assets being auctioned. Where this is so, allowing price discovery permits bidders to learn about their own valuation of the asset through knowing the bids placed by others. In effect, an open combinatorial clock auction mitigates common value uncertainty through information sharing amongst competitors within the auction process about bid pricing.

In the present context, DotEcon considers that common value uncertainty, such as demand and cost uncertainty, is not a substantial consideration for this award, and that against this, ComReg needs to balance the significant risks for competition that may result from an open process.

ComReg would agree with DotEcon's view in relation to the likely extent of common value uncertainty and notes:

- as liberalised 900 MHz spectrum would allow licensees to deploy existing technologies (UMTS) in the 900 MHz band, the cost savings are more incremental in nature and also generally known;

- the demand for 3G services in Ireland, including mobile broadband, is generally well understood; and

- the factors influencing valuations are more likely to be idiosyncratic than not given the presence of existing licensees in the band, likely different migration costs for existing operators, and the different values that may be placed on acquiring a single 2 × 5 MHz block and two 2 × 5 MHz blocks.

ComReg must also consider the potential for strategic bidding or tacitly collusive behaviour which may give rise to non-optimal auction outcomes in an open, multiple-round combinatorial auction given the nature of information sharing necessarily involved.

DotEcon notes that a clear drawback of an open multiple-round auction format is that where there is limited excess demand, open rounds may facilitate a non-optimal outcome where bidders tacitly coordinate behaviour to reduce demand and that where this is considered to be a possibility, there is a case for a sealed-bid auction. In the present circumstances, DotEcon have a concern about the possibility of such an outcome as, in its view, the main focus of competition is likely to be H3GI competing for two 2 × 5 MHz blocks against existing GSM licensees' reluctance to secure only one 2 × 5 MHz block. DotEcon also note that its considerations are necessarily subjective, and remain as such given the difficulties, as previously expressed, of trying with any certainty to assess the nature of competition and the structure of demand prior to any auction. DotEcon recommend that, unless ComReg's concerns around ensuring a competitive process and the potential for weak competition even without tacit collusion can be otherwise allayed, the prudent route is to use a combinatorial sealed bid auction format.

While ComReg has no reason to discount potential participation by new entrants to the mobile market or those seeking to provide mobile broadband services using 900 MHz spectrum, ComReg would not disagree with DotEcon's view that a primary focus of competition for liberalised 900 MHz spectrum is likely to be that between existing GSM licensees and H3GI. To the extent that excess demand may be limited in this regard, ComReg recognises that an open, multiple round combinatorial auction may facilitate strategic behaviour that may lead to a non-optimal result in an open auction.

Other factors relevant to ComReg's consideration are as follows:

- open combinatorial auctions are more complex, slower and more costly relative to sealed-bid combinatorial auctions;

- sealed-bid combinatorial auctions may be more effective at encouraging marginal bidders to compete than an open auction (in light of potential predatory behaviour by larger participants); and

- the sealed-bid format was used in ComReg's 26 GHz auction and there is familiarity with the process and its outcomes by industry participants.

In light of the above factors, and ComReg's statutory objectives of ensuring spectrum efficiency and promoting competition, ComReg favours proceeding with a combinatorial sealed bid auction for this award process.

Q.1. A.	**Do you agree that ComReg should take all reasonable steps in selecting an auction format so as to ensure a competitive outcome?**
Q.1.B.	**Do you agree that a sealed bid format is the most appropriate approach in this case?**

12.2.3 Temporal Lots

A key issue for the auction design is the different dates of expiry for the current GSM licences and the corresponding commencement of new liberalised licences.

In this regard, DotEcon have developed two alternative approaches for "packaging" the available spectrum to address this issue. The difference between the two packaging options is how the time dimension is handled in the auction.

Please refer to Section 7.1 and 7.2 of the DotEcon report for an explanation of time-aggregated and time-disaggregated packaging, the application of these approaches to efficient spectrum assignments and realignment, and the impact these approaches would have on the assignment stage of a two-stage auction.

DotEcon provide an analysis of the two approaches (Section 7.5 of the DotEcon report).

ComReg agrees with the advantages and disadvantages detailed therein. In particular, the primary advantage is that the use of a time-disaggregated approach in the assignment stage of a two-stage auction design will allow bidders to express their preferences for maintaining frequency consistency in order to minimise the costs to operators of moving frequency assignments. Therefore, ComReg accepts that time-disaggregated lots with lot categories corresponding to the two time slices (2011 - 2015 and 2015 - 2030) is the best way forward and will seek its implementation in the design of the assignment stage.

12.2.4 Allowing Early Liberalisation

In Section 5.1 of Consultation 09/14, ComReg considered that the liberalisation of all existing GSM licences could distort competition in the mobile market by potentially conferring a significant advantage on the existing GSM licensees that would not be available to a non-GSM mobile operator (H3GI). It was also noted that there would be no requirement under the terms of the then draft Radio Spectrum Decision for Member States to liberalise existing GSM licences, and, given the short licence term remaining on two of the existing GSM licences, any operator benefits (and by extension any consumer benefits) that could be derived from liberalisation of the existing licences would likely be reduced. In light of these

factors, ComReg proposed that any existing 900 MHz GSM licence (and any spectrum retained to address GSM legacy issues under Option 2) would not be liberalised, while all new licences in the 900 MHz band would be issued on a liberalised basis and made available via open competition.

DotEcon's analysis has suggested that this position could raise the issue of a potential distortion to competition if Vodafone, O2, H3GI and/or another operator could have access to liberalised spectrum from 2011, in circumstances where Meteor might not have access to 3G spectrum at 900 MHz until 2015, unless some provision was made for early liberalisation. This issue and possible solutions are detailed in Section 8.2 of DotEcon's report.

It is noted that under ComReg's Option 1, it would have been possible for Meteor to obtain liberalised 900 MHz spectrum at auction from 2011 but only on the basis that it returned some or all of its present spectrum assignment prior to the proposed auction so as to comply with the 2 × 10 MHz spectrum cap.

In DotEcon's view, however, there would be insufficient incentives for an existing operator to do so where the release of existing spectrum is not contingent on the operator winning a liberalised licence (such as where existing spectrum assignments could continue to be used to provide 2G services for which there would be demand). In these circumstances, DotEcon suggest that it would be necessary to link the release of existing spectrum with winning new licences.

Upon further consideration, ComReg agrees with DotEcon's assessment of likely incentives for existing licensees in this regard. In addition, ComReg is mindful of minimising any potential distortions to competition through its implementation of the Amending Directive and EC Decision and also welcomes any suggestions that would increase the possibility of achieving earliest liberalisation of the entire band in a manner that would minimise such distortions.

In summary, DotEcon's option for early liberalisation, under its auction format proposal, would be to augment package bidding to include the possibility of releasing spectrum as well as buying lots, subject to the continuing operation of the spectrum cap (see Section 8.2 of the report for further details). ComReg notes that such an option would not be practicable and may even be impossible under an SRMA auction format and this is a further reason why ComReg considers that a combinatorial auction format is the ideal format in present circumstances.

An issue which DotEcon raises in relation to its early liberalisation option and in relation to which ComReg would seek stakeholders' views is the nature and level of any "rebate" that would be justifiable in the event of the early release of spectrum. In this regard, although DotEcon notes that it would be possible to include an option for early release without any "rebate" for the loss of the residual term, it considers that this approach might give too little incentive for operators to seek to liberalise licences early. This arises because, for an existing licensee returning spectrum, its bid would be based on the 'upgrade' value of a liberalised licence relative to its existing licence. In contrast, for a bidder without a GSM licence, its bid would be based on the full value of the licence.

On the other hand, DotEcon note the theoretical and practical difficulties associated with developing a model based on the value of the spectrum (particularly in a situation where the seller of the non-liberalised spectrum would also be the buyer of the liberalised spectrum, such that the price of licences in the auction would not reveal the true value of the spectrum being released).

In light of these considerations, DotEcon recommends an approach whereby an operator returning existing spectrum usage rights would receive a "rebate" based on the original purchase price of the licence and the remaining unexpired term (assuming that there would be some amortisation schedule).

ComReg considers this approach to be objectively justified and proportionate, in addition to being pragmatic and straightforward (particularly as it would be based on readily available information). In particular, it seeks to strike a balance between alternative approaches which are, in the first approach, unlikely to achieve the outcome of early liberalisation of the entire band and, in the second approach, unlikely to achieve liberalisation in a manner that would be efficient, clear and transparent. In particular, ComReg would be concerned that the use of a methodology that would not be theoretically appropriate (and thus lacking in objective justification), could itself distort competition by providing a cost advantage to a particular operator, and/or would create regulatory uncertainty and the risk of delay to the auction process.

ComReg sees merit in the methodology proposed by DotEcon and, with a view to adopting this approach in the auction format, seeks views from stakeholders in relation to the following:

Q.2.	**Do you agree that a "rebate" in respect of the remaining term of a licence should be provided for in ComReg's auction design?**
Q.3.	**What factors should ComReg consider in calculating any such rebate?**

12.3 Draft Auction Rules

To assist understanding of Modified Option 1 as put forward by DotEcon, ComReg would refer stakeholders to the draft auction rules, based on the matters set out above.

The draft auction rules have been developed to provide clarity and certainty to stakeholders over the proposed auction process and to ensure that the process would result in an efficient and effective auction outcome. The proposed five stage award process and the draft auction rules are detailed in Section 9 of DotEcon's report.

ComReg has carefully reviewed these draft rules in light of its statutory objectives and is satisfied that they would give effect to the proposed auction objectives and parameters in an objectively justified, proportionate, non-discriminatory and transparent manner. Clearly, as some of the elements of the auction format are the subject of consultation, these draft auction rules are subject to change.

Nevertheless, ComReg is presenting these draft rules to provide stakeholders with a view to providing as much visibility as possible as to how the proposed auction format would likely operate, so as to fully inform their understanding of the auction format and, in turn, their response to the consultation questions in relation to same.

13 Proposed Auction Fees

This section considers the nature and level of auction fees that would apply to the auction format proposed in Section 12 and discusses the following key issues:

- the reasons for, and determination of, an applicable minimum price;
- determining the balance between upfront and ongoing fees; and
- options for deferral of payments and indexation of those payments.

Before addressing these issues and to assist the reader, the following terminology is defined that will be used extensively in this and following sections of this paper[79].

13.1 Definitions

Reserve Price

A reserve price in an auction is an established price floor below which a lot will not be sold. If an auction is uncompetitive, lots may be sold at the reserve price if they are sold at all.

Spectrum Usage Fee (SUF)

The SUF is an on-going annual fee payable throughout the duration of the licence and is additional to the amount that would be payable at the date of auction. These on-going fees clearly affect the value of a spectrum licence to bidders in terms of the expected net present value of a licence and can be expected to lower overall prices achieved in an auction.

Minimum Price

The minimum price is the sum of the reserve price plus the sum of annual SUFs. It therefore represents the lowest overall price that the seller in an auction would be prepared to accept (and the minimum overall amount that a bidder would need to pay) for a licence over its entire duration, even where there may be little or no competition in an auction[80].

13.2 Relevance of a Minimum Price

A key consideration in auction implementation is determining whether a minimum price would be required and, if so, at what level it should be set.

[79] These definitions are further elaborated or defined in Section 10.1, of DotEcon report.

[80] It is important to bear in mind that minimum prices only affect the auction outcome if there is no excess demand at the minimum price. As set out in Section 6.8, ComReg expects demand to exceed supply for liberalised 900MHz spectrum, but cannot be certain this will be the case on auction day.

In theory, an auction could be implemented with no minimum price or a very low/nominal minimum price. ComReg notes that setting low minimum prices has been relatively popular with some European National Regulatory Authorities in recent times so as to avoid the risk of "choking off" demand for spectrum. In these circumstances, a low minimum price, reflecting the administrative costs incurred in running the auction, should still however be sufficient to deter frivolous, non-serious bidders.

On the other hand, there may be reasons why a significant minimum price may be warranted. In particular, where collusive behaviour is a risk in a particular auction, such as where there may likely be a limited number of participants and/or limited excess demand, setting a low minimum price may facilitate and incentivise collusive behaviour amongst participants. In this regard, an opportunity for bidders to obtain access to spectrum at a price below the real economic value of such access to bidders may provide the incentive for bidders to engage in tacitly collusive behaviour. In this context, it can be seen that setting a higher minimum price, and particularly one that would more closely reflect the real economic value of spectrum access, would reduce the opportunity/ability and incentives of bidders to engage in such behaviour. That is, the reward would be much lower for engaging in such conduct. To fully counteract the effectiveness of such a price-saving strategy, the minimum price should be set at the economic value of the spectrum to the user as this effectively dissolves any profit gain from adopting such a strategy.

In addition, where competition may be weak in an auction due to external factors (such as technological or standards uncertainty or the state of capital markets and/or capital availability), setting a low minimum price may not see the auction reveal the true, long-run economic value of spectrum access. This would result in an undervaluation of the spectrum which in turn represents a reduction in the efficiency of the auction.

ComReg notes that DotEcon has recommended the adoption of a significant minimum price in present circumstances to avoid the potential concerns referred to above.

ComReg has considered DotEcon's recommendation and the reasons for it. In particular, ComReg recognises the potential for a limited number of potential participants and/or limited excess demand for this particular auction and therefore sees merit in implementing appropriate measures aimed at minimising the ability and incentive for participants to engage in any potentially collusive behaviour. ComReg would also see such measures as being appropriate in light of its statutory objective of promoting competition.

On a further issue, ComReg's view has long been that the advantages of liberalising the *full band* as quickly as possible has the potential of relatively quickly delivering new services to consumers as well as potentially introducing a new player in the 900 MHz band. Therefore ComReg has not considered that there is any future value in withholding part of the 900 MHz band from the auction, at this stage, on

the basis of perceived social value[81].

In light of these considerations, ComReg has determined that the following factors should inform the determination of the minimum price for this award:

- the minimum price should not give rise to or increase incentives for collusive behaviour;
- the minimum price should deliver a fair return to the State for the use of this finite natural resource and the price of spectrum should reflect its economic value to the user[82];
- the minimum price should not be set so high as to choke off demand;
- the minimum price should not be set so low that there is participation by frivolous bidders;
- the minimum price should not reflect any "social option value"; and
- the administrative costs of running the award process should be recovered from the minimum price set.

13.3 Methodologies for Setting a Minimum Price

DotEcon examines four possible approaches to setting a minimum price and assess the merits of these approaches in the context of an auction for liberalised 900 MHz spectrum in Ireland in Section 10.3 of its report. A brief summary of the different approaches and the advantages and disadvantages of each, as identified by DotEcon and ComReg, is set out below.

13.3.1 The Modelling costs and revenues approach

This approach involves constructing high-level business cases for likely bidders. The incremental profits of the operator from these business cases would provide an indication of the buyer's willingness to pay for the spectrum, and thus an upper bound for the minimum price level. Similar valuation approaches are typically used by bidders in preparing for spectrum auctions.

---

[81] There may be many public policy reasons for not releasing spectrum too cheaply if, potentially at least, there might be better future uses for that spectrum. Competition may be weak in an auction for many reasons, including poor timing, technological or standards uncertainty or the state of capital markets. In such cases, there may be public benefit (Social value) in deferring the award of spectrum until conditions are more favourable and uncertainty is reduced for bidders – this is known as the perceived Social Option Value.

[82] Report of Working Group on Spectrum Policy, Department of Communications, Energy and Natural Resources, Sept. 2008, Section 6, bullet point 8; *Spectrum pricing should deliver a fair return to the State. The spectrum is a finite natural resource that enables the provision of essential services for both public service and commercial purposes. The price of spectrum to the user should reflect its economic value to that user.*

Advantages of modelling costs and revenues approach:

- it would be informative, in theory, as it would provide an indication of how increasing the minimum price may discourage certain types of bidder and affect the probability of spectrum going unsold; and

- it could theoretically establish the value of spectrum to the user.

Disadvantages of modelling costs and revenues approach:

- there could be a substantial difference in the business cases of interested bidders. This difference is acute in a technology neutral and service neutral licence award where different bidders may place different importance on the type and nature of service to be offered as well as in the type of technology to be used in delivering those services. The difference in business cases is further complicated in an award that may attract incumbents as well as new players to the band in question and indeed a new entrant to the market as a whole. These differences limit the applicability of this type of approach;

- it would be complex to conduct, and is likely to be resource and time intensive;

- there would also be a considerable degree of uncertainty in the valuations given the information asymmetry faced by ComReg, and;

- due to the confidential and commercially sensitive nature of much of the required information, it would be difficult to achieve transparency.

DotEcon conclude that building business cases does not seem like a reliable or useful approach for determining minimum prices for this band. Having taken into account the experts' view, and after consideration of the advantages and disadvantages listed above, ComReg considers that the use of the modelling costs and revenues approach has for this award limited utility and would not, in practice, appear to provide a particularly reliable or informative approach for determining minimum prices for this award.

13.3.2 Low but non-trivial minimum price approach

This is the simplest approach to minimum price setting. Under this approach, the minimum price is simply set at the lowest level that could be expected to deter frivolous participation in the process.

DotEcon has estimated that, based on an international comparison, a low-but-non-

trivial reserve price[83] would be in the order of around €100,000 for a 2 × 5 MHz lot of 900 MHz spectrum in Ireland.

Advantages of a low but non-trivial minimum price approach:

- it is simple to implement and would avoid the need for extensive justification of the reserve price methodology;
- it is transparent;
- in theory, it should guarantee that demand would not be "choked off "inefficiently; and
- it should avoid potential claims of revenue raising.

Disadvantages of a low but non-trivial minimum price approach:

- if there is deficient demand, revenues would likely be very low, which may represent a failure to obtain the real economic value of spectrum access;
- in certain circumstances, for example where there is a concern that only a small number of bidders might participate, it might facilitate or encourage strategic behaviour among bidders designed to frustrate a competitive competition; and
- it would not establish the real economic value of spectrum access to users.

Having considered the advantages and disadvantages of this approach as detailed, ComReg considers that this approach could give rise to or incentivise collusive behaviour and is therefore not appropriate to this award process.

13.3.3 Administrative cost approach

Another approach would be to set the minimum price at such a level which would cover the incremental cost of administering each licence. In theory, this provides a lower bound on the minimum price that ComReg might set. An extension on this approach would be to include the recovery not of just the incremental costs of the particular award, but also some contribution to the common costs of running a spectrum authority.

In practice, and particularly in the present case, the administrative costs of running an award are likely to be very small relative to the economic value of spectrum access. In this context, this approach may not be much different to the 'low but non-trivial' approach and the potential disadvantages would appear to apply equally.

[83] Regarding non-trivial pricing the benchmarks used had no annual fees, so in those cases the reserve price was also the minimum price. However, in the case of Ireland where ComReg intends to implement annual fees, the €100 000 would relate to the reserve price.

13.3.4 Benchmarking Approach

This approach involves gathering data regarding minimum prices and licence prices for awards of comparable spectrum in Ireland and abroad, and then adjusting as appropriate to provide benchmarks for Ireland. Benchmarking is a versatile approach that facilitates varying treatment of the relevant data to produce a range of benchmark values for a specific purpose.

Advantages of a benchmarking approach:

- the determination of the minimum price is based on a number of similar awards across a number of different jurisdictions;
- it would not require ComReg to have access to confidential/commercially sensitive information of market participants;
- it can be easily made transparent;
- it takes into account a range of demand scenarios inherent in each auction;
- it was successfully used in ComReg's 26 GHz auction process;
- a sufficiently large data-set should allow ComReg to empirically establish the average economic value of spectrum to the user which can then be reflected in the minimum price.

Disadvantages of a benchmarking approach:

- the result must be carefully considered to ensure that "like is compared to like"; and
- it requires an extensive data-set.

Having carefully considered the four approaches, the relative advantages and disadvantages of each approach as determined by DotEcon and ComReg, the applicability of each approach to Ireland's circumstances and the context of this spectrum award process, ComReg is of the view that the advantages of the benchmarking approach to determining the minimum price outweigh the other three approaches considered.

In particular, ComReg considers that:

- A modelling costs and revenues approach poses two particular difficulties. Firstly in terms of the information asymmetry between ComReg and potential bidders. Potential bidders will have access to their own confidential information to assist them in valuing the liberalised spectrum. That confidential information is not available to third parties involved in the process, including ComReg. Because of the importance of bidders'

existing market positions in determining what they might be prepared to pay, it would be very difficult for an outside party to build a business case model in the same way that the relevant potential bidder might, rendering the approach unreliable for determining minimum prices for this award. Even if bidders were willing to supply all the relevant data it would be difficult for ComReg to guarantee the reliability of the data which may be conditional in nature and subject to substantive caveats. Further, because of the commercial sensitivity of the data that existing mobile network operators would need to supply as inputs to the model, ComReg would not be able to publish any of these details, thus limiting the transparency of the process. Secondly, the differences in business plans due to the technology and service neutral nature of these licences would make a realistic assessment of a single minimum price applicable to all circumstances undependable.

- Neither a low but non trivial approach or an administrative costs approach would not address ComReg's concerns regarding the potential for collusion in this award or guarantee that the economic value of the spectrum will be realised;

- A benchmarking approach does not suffer from information asymmetry difficulties offers the potential to reasonably mitigate any potential for collusion and is fully transparent. While the approach has some shortcomings, as set out further below, ComReg believes that these can be mitigated through the approach identified by DotEcon at Section 10.5 of its report.

Accordingly, ComReg proposes to adopt the benchmarking approach to determining the minimum price as the most appropriate methodology for this award process.

13.4 Applying the Benchmarking Approach

DotEcon has conducted a benchmarking exercise using a large sample of price data covering 114 award processes across 28 countries worldwide, covering 5969 licences. See Section 10.5 of DotEcon's report.

The data used relates only to awards of frequencies available for 2G and 3G use, and from auctions where price is the only winning determinant and is thus comparable across awards. To ensure comparable benchmarks for Ireland, suitable adjustments were made for price differences, inflation, exchange rates and licence duration differences.

However, determining the appropriate sample and benchmark metrics is ultimately a matter of informed judgement. For this reason, DotEcon considered it appropriate to develop benchmarks drawing on different samples and approaches, to inform a qualitative comparison and has taken two different approaches to benchmarking based on actual prices achieved in auctions - an average-based approach and a regression-based approach (see section 10.5.2 and 10.5.3, DotEcon report).

13.4.1 Approach 1: Average-based benchmarks

The approach considers the average price per MHz per head of population of auctions from various subsets of the overall data set. When estimating average-based benchmarks, DotEcon considered five different sets of awards:

1. all mobile (2G and 3G) licences sold in an auction;
2. all licences awarded in European countries;
3. all licences awarded in countries with GDP similar to Ireland;
4. all GSM900 and GSM1800 licences in the dataset; and
5. all 3G licences in the dataset.

Based on these five data sets, the results listed in Table 8 of the DotEcon Report, reproduced below for convenience, were obtained for an average licence price per MHz per population. The implied value of a licence for a 2 × 5 MHz lot in Ireland was calculated by multiplying the price per MHz per population by 10 (the size of a licence in MHz) and the population of Ireland (assumed to be just over 4.2 million[84]).

Benchmark group	Average price per MHz per population	Implied value of 2x5MHz in Ireland
All mobile licences sold in an auction	€0.691	€29.1m
All licences sold in an auction in a Europe	€0.546	€22.9m
All licences sold in countries with similar GDP per capita	€0.625	€26.3m
All GSM licences	€0.790	€33.2m
3G licences	€0.800	€33.6m

Table 5 Benchmarks using averaging method (Table 8 from DotEcon report)

The average-based benchmark approach implies that the value of a 2 × 5 MHz 900 MHz lot in Ireland to be in the range of €22 million and €34 million.

13.4.2 Approach 2: Regression-based benchmarks

The second approach used econometric analysis to identify a set of statistically significant metrics that influence the value of spectrum and, using these metrics, to predict a licence value for a 900 MHz licence in Ireland. DotEcon regressed the price per MHz per head of population on various explanatory factors that might

[84] See DotEcon footnote number 48.

affect the price of spectrum in an auction, including:

- country characteristics such as the income level of the country, its demography and geography;
- the level of competitiveness in an auction;
- licence characteristics such as where the licences sold were national or regional and the potential licence use;
- the competitiveness of the telecommunications market (ratio of bidders to winners; and
- time trend of prices.

A regression analysis was then conducted on the following three data sets to jointly consider the influence of the various factors that might influence spectrum value:

1. all mobile licences sold in an auction;
2. all mobile licences sold in Europe; and
3. all GSM licences.

DotEcon used a weighted least squares estimator (using the same weights for each individual licence as for the calculation of weighted average price per MHz per population for each auction as used in the average-based benchmark approach) to estimate the coefficients of the model. The results of this regression approach confirmed the influence of various factors on spectrum value:

- the income level in a country has a positive effect on the price of spectrum (controlling for all other factors in the regression equation);
- the larger the area per head of population, the lower is the price at which the spectrum sells;
- the more dispersed the population in a country is, the higher the cost to roll out a network will be;
- the higher the level of competition in the auction, the higher is the licence price in the auction;
- increasing the number of mobile network operators in the market lowers licence values;
- there has been a decline in spectrum prices from a peak that was achieved during the telecommunications equity market “bubble” in 2000.

The estimated coefficients from the regression analysis were used to predict the minimum price of the spectrum to be sold in Ireland for each of the three data sets identified above. The results are shown in the table below. The regression analysis

benchmarks imply that the minimum price of a 2 × 5 MHz 900 MHz lot in Ireland to be in the range of €24 million and €26 million.

Data set	Price per MHz per population	Implied value of a 2x5MHz block
All mobile licences	€0.578	€24.3m
Auctions in Europe	€0.397	€16.7m
All GSM auctions	€0.622	€26.1m

Table 6 Predicted value of Irish spectrum based on regression analysis (Table 11 from DotEcon report)

13.4.3 Results of the Benchmarking exercise

The table below summarises the results of the two different benchmarking approaches considered by DotEcon. Also included is the average price of the four 3G licences awarded in Ireland at 2.1 GHz (€22.3 million).

Benchmark group	Technique	Implied value of a 2x5MHz lot
All mobile	Average benchmark	€29.1m
	Regression analysis	€26.1m
Europe	Average benchmark	€22.9m
	Regression analysis	€16.7m
GDP	Average benchmark	€26.3m
GSM only	Average benchmark	€33.2m
	Regression analysis	€24.3m
3G only	Average benchmark	€33.6m
	Ireland average	€22.3m[54]

Table 7 Summary of Benchmarks (Table 12 from DotEcon report, footnote 54 refers to footnote 54 of the DotEcon report)

The estimated minimum price benchmarks for a 2 × 5 MHz licence ranged from €16 to €34 million for a 15-year licence. Minimum price Benchmarks created using a simple average method suggest the upper end of the range, whereas minimum

price benchmarks based on econometric methods suggest the lower end of the range.

It is important to note that using a benchmarking approach is likely to result in an underestimate of the minimum price of liberalised 900 MHz spectrum as:

- there have been no competitive awards for liberalised 900 MHz spectrum and so there are no available benchmarks for 3G spectrum at 900 MHz. Therefore, in conducting the benchmarking exercise DotEcon has relied on existing GSM 900 and GSM 1800 auction results. These results do not take into account the likely significantly increased value of liberalised licences compared to GSM licences; and

- as there is limited auction data for the GSM bands, the data set used by DotEcon was expanded to include licences in other related bands (e.g. in the 3G 2.1 GHz and 2.6 GHz band). As relative to the 900 MHz band, these higher frequency bands have significantly reduced propagation characteristics, it is assumed that they are less valuable and their inclusion further lowers the overall benchmark results.

Taking these two factors into account, it is ComReg's view that the implied minimum price of a 2 × 5 MHz lot from DotEcon's benchmarking results is more likely to be lower than the actual expected overall price of liberalised 900 MHz spectrum in Ireland.

ComReg has carefully considered the benchmarking exercise undertaken by DotEcon. While noting that, for the two reason explained above, the benchmark values are likely to be lower than the actual expected value of liberalised spectrum, ComReg has no data available with which to determine the likely difference, and therefore proposes to set the minimum price for this award at €30 million per lot which would be at the higher end of the benchmark range proposed by DotEcon.

Q.4.	**Do you have any comments on the setting of minimum prices or the benchmarking process employed by DotEcon and proposed to be adopted by ComReg in arriving at a minimum price?**

13.5 Structure of Reserve Prices and Spectrum Usage Fees (SUF)

Having come to a view that the minimum price should be €30 million per lot, and bearing in mind that the minimum price is comprised of the sum of the annual SUFs over the duration of the licence and the reserve price, it is now necessary to determine the proportion of the minimum price comprised by each of these elements.

In this regard, ComReg recognises that there is some tension between the objective/aim behind each of the elements that comprise the minimum price.

First, in light of ComReg's objective of ensuring the efficient use of spectrum, ComReg's aim in using and establishing the correct value of SUF's is to incentivise licensees to hand back part or all of their spectrum holdings in the event that they no longer have use for the spectrum. In particular, ComReg would be seeking to set the level of the SUF sufficiently high so as to incentivise the return of unused or under-utilised spectrum, but not so high that it penalises licensees who are making efficient use of their spectrum. This is best done by ensuring the SUF reflects the opportunity cost of spectrum.

Secondly, and at the same time, there would be advantages in setting the upfront component of the minimum price sufficiently high with the aim of ensuring that participation in the auction is limited to serious, credible bidders. In addition, there could be increased default risks associated with deferring too much of the minimum price into the future in the form of SUFs.

In light of the different objective/aim of each element, DotEcon was asked to consider whether there were any benchmarks or examples by which to determine the suitable apportionment between these two elements.

DotEcon first examined the level of SUFs currently in place for licences in Ireland in the GSM bands, and at 2.1 GHz, as well as the SUFs in other EU countries. The current SUFs for GSM and 3G licences in Ireland are set out in Table 13 of the DotEcon report, reproduced below for convenience:

	Meteor, O2, Vodafone	H3GI	Per MHz spectrum
GSM 900 (2 x 7.2MHz)	€ 914,220		€ 63,487.50
GSM 1800 (2 x 14.4MHz)	€ 1,371,312		€ 47,615.00
3G (2 x 15MHz + 1 x 5MHz)	€ 2,222,045		€ 63,487.00
3G (2 x 15MHz)		€ 1,904,610	€ 63,487.00

Table 8 Current GSM and 3G annual spectrum usage fees in Ireland
(Table 13 from DotEcon report)

DotEcon compared Irish SUFs to those in other EU countries for similar spectrum awards. This review revealed that many countries have either low or no annual SUFs with the greatest proportion of total spectrum fees paid upfront as a spectrum access fee. It also revealed that some other countries, such as Spain, France and Portugal have relatively high SUFs. In light of these variances, which could be due to varying national policies and/or varying national legislative frameworks, it is difficult to make definitive conclusions.

DotEcon have suggested that:

- at least 50% of the minimum price be implemented through the SUF to provide spectrum release incentives (see Section 12.2 of the DotEcon report); and
- the amount accrued to the annual SUFs should be annualised using a discount factor that reflects the cost of capital of an operator.

Based on these recommendations, DotEcon proceeded to consider the structure of reserve prices and SUFs under two minimum price scenarios: €25 million and €30 million (Section 12.2, DotEcon report).

Given the available information, and taking account of DotEcon's analysis and recommendation, ComReg accepts the expert's view that 50% of the minimum price of €30 million should be implemented through the SUF. In ComReg's view a reserve price of €6.3 million for a licence in 2011-2015 and a reserve price of €10.2 million for a licence in 2015-2030 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[85]), SUFs would amount to €1.8 million p.a. which, in ComReg's assessment, would be adequate to incentivise licensees to return unused or under-utilised spectrum especially when viewed over the long term.

ComReg would appreciate receiving views and data in relation to the matters set out above.

Q.5.	**Do you have any comments on the structure of reserve prices and spectrum usage fees?**

13.6 Deferral Options and Indexation

There are several reasons why ComReg considers it may be appropriate to provide an option for bidders to defer some of the auction payments, especially in the early stages of any new licence. First, in the current financial and economic climate, it may be prudent to safeguard against unexpected financing problems which bidders may face. In addition, the high levels of capital expenditure that would likely be faced by a bidder in the first several years of its licence (such as due to rolling out infrastructure, marketing expenses etc), if combined with substantial payments during this time, may be too burdensome for potential bidders, such as new entrants to the band or market.

While a deferral option would appear sensible for these reasons, ComReg must also

[85] The value used equates to eircom's Weighted Average Cost of Capital (see ComReg 08/35) and is utilised in this context as a proxy for the telecommunications industry operator cost of capital. This proxy was utilised in the 3G licence competions.

take reasonable steps to ensure that credible bids are received and any potential for speculative bidding is addressed through the auction design and implementation.

ComReg is anxious to ensure only credible bids are received and to achieve this, ComReg has already indicated that licensees will be required to deposit the total reserve price as part of the application process, and is further of the view that successful bidders will be required to pay at least, but not limited to, 50% of the excess of a bidder's winning price over the reserve price, before any licence is issued following the completion of the auction.

As noted in the DotEcon report (Section 13.1), in the current financial and economic climate, it seems prudent for ComReg to have safeguarded against financing constraints disrupting the auction, that is if capital constraints were to adversely affect or even diminish bidders. ComReg accepts this view and the suggestion that a safeguard against such problems is to provide options for deferral of payments. ComReg proposes that the remaining amount, of no more than 50% of the excess of bidders winning price over the reserve price, could optionally be deferred until the spectrum becomes available for use and payment of the outstanding amount spread across three equal payments in the first, second and third years of the licence.

Advantages of the proposed deferral option are:

- it is a prudent approach that goes some way to safeguard against potential financial constraints (up to a certain level);
- as a substantial amount of the minimum price will have been paid, the option to defer payment should deter frivolous bidding; and
- it is flexible enough so that 50 -100 % of the amount can be paid upfront or before the end of the above mentioned three-year period if required.

Disadvantages of the proposed deferral option are:

- there is a risk that a licensee would default on the outstanding amount; and
- it does not provide a mechanism that safeguards against severe financial constraints.

On balance ComReg favours providing a deferral scheme as proposed by DotEcon as opposed to providing no such scheme, even with the stated disadvantages, as this could mitigate a reasonable level of financial constraints that may affect winners of 900 MHz spectrum.

As noted by DotEcon (Section 13.1, DotEcon report) ComReg is cognisant that there is always some risk of payment default whenever a deferred payment scheme is offered. Therefore, to mitigate against this ComReg agrees with DotEcon that it is necessary to apply an interest rate to deferred payments that at least reflect this risk. ComReg accordingly proposes that an annual interest rate of 12% should apply to any deferred payments, as this is likely to exceed the cost of usual commercial funding and not to inappropriately incentivise take up of the deferment option. For the avoidance of doubt, this deferral option is only intended to provide a safeguard

against unforeseen funding difficulties.

As further observed by DotEcon (Section 13.3, DotEcon report) under this structure, both SUFs would stretch as far as 2030 and deferred payments could stretch as far as 2018, and that it would also be prudent to index these amounts against any increase in inflation. ComReg accepts this view and intends to use a nominal interest rate to calculate the interest costs of any deferred payments that includes reasonable expectations regarding inflation. Indexation should not create any additional risks for bidders as a mobile operator's revenues and costs would in any case be affected by any increase in inflation.

Q.6.	**Do you have any views on ComReg's proposed deferred payment scheme and the indexation that will apply?**
Q.7.	**Are there any other approaches ComReg should consider to mitigate any potential for auction disruption arising from the current financial and economic climate?**

13.7 Summary of Proposals and Conclusion

A summary of ComReg's proposals in this chapter are as follows:

1. Set a minimum price of €30 million for each single 2 × 5 MHz block of liberalised 900 MHz spectrum made available in the auction.

2. Set a reserve price of €6.3 million for a 4 year licence (2011-2015) and a reserve price of €10.2 million for a 15-year licence (2015-2030). These reserve prices, applicable to each 2 × 5 MHz block will need to be deposited in full as part of the application process.

3. At least 50% of the excess of a bidder's winning price over the reserve price will need to be paid before any licence is issued, within the timeframe set by the auction rules. Successful bidders choosing to defer no more than 50% of the excess of their wining price over the reserve price will be required to pay the outstanding amount, in at least equal payments in the first, second and third year of the licence, at an interest rate of 12%.

4. 50% of the minimum price would be recovered via the SUFs.

5. SUFs will be set at €1.8 million per annum (assuming a discount rate of 10.2%).

6. SUFs and interests costs as a result of deferred payments will be indexed against inflation.

Minimum Price	Proportion of minimum price in SUF	Discount Factor	Annual SUF	Reserve Price for 2011-2015 licence	Reserve Price for 2015-2030 licence
€30 million	50%	10.20%	€1.8m	€6.3m	€10.2

Table 9 Summary of Proposals

ComReg identified earlier the six factors that should inform the determination of auction fees for this award:

1. *The minimum price should not give rise to or increase incentives for collusive behaviour*

The benchmarking approach, using a very large database, has empirically determined the economic value of 2G and 3G spectrum to the winners of 6576 spectrum licences and referenced these to Ireland and the Irish market. ComReg expects that setting the minimum price at €30 million should counteract the effectiveness of any collusive or strategic pricing strategy.

2. *The minimum price should deliver a fair return to the State for the use of this finite natural resource and the price of spectrum should reflect its economic value to the user*

The proposed minimum price of €30 million, in ComReg's view would reflect the nominal economic value of 900 MHz spectrum and should deliver a fair return to the State for use of this natural resource over the lifetime of the licence.

3. *The minimum price should not be set so high as to choke off demand*

In proposing that 50% of the minimum price will be payable through annual SUF's,the reserve prices of €6.3 million to €10.2 million are not unduly onerous, particularly when viewed in the context of the spectrum access fees of circa €50 million or €110 million (depending on licence type) charged in the 3G licence beauty competitions. These reserve prices are unlikely, in ComReg's opinion, to choke off demand from serious bidders.

4. *The minimum price should not be set so low that there is participation by frivolous bidders*

These reserve prices are sufficiently high, in ComReg's opinion, that taken in conjunction with the auction rules covering forfeiture of the deposit (which would consist of the entire reserve price), they should deter frivolous bidders from entering the competition.

5. *The minimum price should not reflect any "social option value"*

Concerning "social option value", ComReg does not believe that there are any

gains to be made in delaying the release of any 900 MHz spectrum at this stage. ComReg is of the opinion that early liberalisation of the band far outweighs any "social option value" that may be lost.

6. The administrative costs of running the award process should be recovered from the minimum price set

It is ComReg's view that the administrative cots of running the award process as currently proposed in Section 12 of this paper should amount to a small percentage of the total reserve prices of all the spectrum blocks being released and should be capable of being comfortably recovered from the reserve prices. On-going costs, in the same manner, should be comfortably recovered from the SUFs and it is not ComReg's intention to levy any additional charges for this purpose.

ComReg notes the judgement of the European Court of Justice ("ECJ") in case C-369/04 in which it was established that the issuing of mobile phone licences cannot constitute an economic activity within the meaning of Article 4(2) of the Sixth Directive[86] and ComReg considers that the findings in this case will apply to the proposed auction competition.

[86] Sixth Council Directive 77/388/EEC of 17th of May 1977 on the harmonization of the laws of the Member States relating to turnover taxes – Common system of value added tax: uniform basis of assessment.

14 Coexistence of Future and Legacy Services and Re-alignment Issues

The presence of legacy GSM services in non-liberalised assignments in the 900 MHz band has implications for consumers, existing operators and winners of future assignments in the 900 MHz band.

ComReg has put forward proposals in Section 12.2.4 of this document which provide for a competitive, auction-based mechanism by which Meteor could gain access to liberalised spectrum in advance of the expiry of its existing GSM 900 MHz licence in 2015. This mechanism is optional and Meteor may decide not to avail of it.

In the event that Meteor continued with its GSM-only licence until its expiry in 2015, there is the possibility of issues arising regarding the efficient use of neighbouring blocks of spectrum in the 900 MHz band, most notably in relation to Block E in the diagram below.

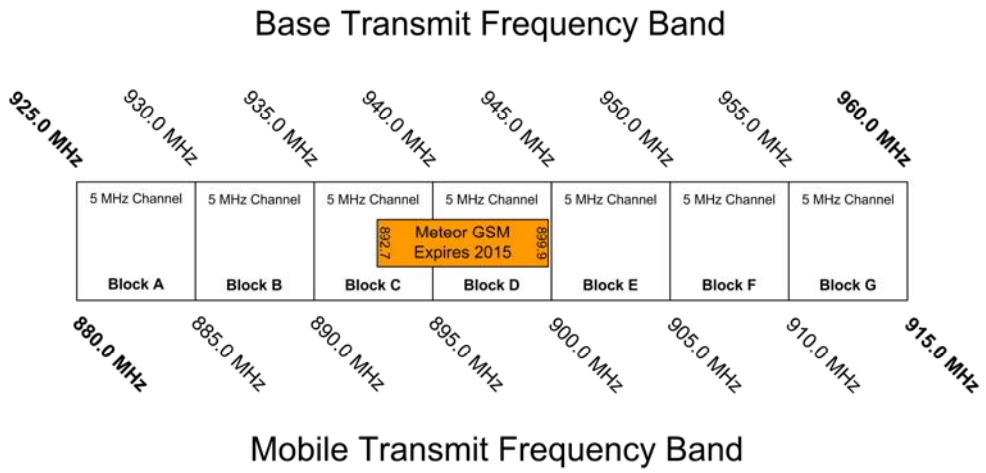

Figure 2 Meteor's current assignment in the 900 MHz band

14.1 GSM and UMTS Separation requirements under the EC Decision

By way of background, stakeholders are referred to Section 5 of DotEcon's report for discussion regarding separation requirements, coordination risk, and various options in relation to same.

The EC Decision recommends a minimum carrier separation of 2.8 MHz between GSM and UMTS carriers[87].

[87] In the absence of bilateral or multilateral agreements between neighbouring networks (see Annex to the EC Decision).

ETSI and 3GPP[88] equipment standards define the radio frequency channel raster for GSM and UMTS systems in the 900 MHz bands on the basis of a 200 kHz spacing. This facilitates, for example, integration between dual mode GSM and UMTS terminals operating in the same band and reflects the evolutionary nature of 3G technologies. Therefore, in a 5 MHz wide channel a UMTS operator has the option to locate the UMTS carrier at a distance of either 2.4 MHz or 2.6 MHz from the lower channel edge.

Irrespective of the outcome of an auction under Modified Option 1, a degree of frequency coordination and cooperation in adjustment of individual base station parameters is likely to be required between future licensees so as to:

- facilitate operation of their respective networks;
- transition from one technology to another[89]; and
- avoid undue interference to each other.

ComReg notes that frequency coordination and cooperation currently takes place on a regular basis between GSM and 3G operators in their respective frequency bands so as to address radio wave propagation, site location and sharing issues, and network optimisation.

14.2 Potential outcomes under Modified Option 1 in light of Meteor's existing GSM 900 MHz assignment

In general, until the outcome of the auction under Modified Option 1 is known it is not possible to identify the specific nature of coordination issues which are likely to arise between licensees. In this respect, ComReg's general preference is to allow licensees to negotiate and determine the most appropriate coordination with their neighbour/s and, as a last resort, for ComReg to intervene to ensure compliance with the technical conditions of the EC Decision.

In light of Meteor's existing GSM licence (and that the centre frequency of its uppermost GSM channel in Block D is only 200 kHz from the edge of Block E, however, it is apparent that interference (and the need for coordination and cooperation) could arise between Block D and adjoining blocks. These issues could also impact upon the manner in which the proposed auction would be run and the ability of same to obtain spectrally and economically efficient outcomes. In this regard, please refer to DotEcon's general discussion regarding coordination risks and its implications for auction design (at Section 5.1.3 and 5.1.4).

[88] ETSI (European Telecommunications Standards Institute) and 3GPP (3rd Generation Partnership Project) are telecommunications standards bodies producing technical standards, specifications and reports on GSM and 3G systems. ETSI also covers many other areas of telecommunications.

[89] For the avoidance of doubt all new licences will contain an obligation to facilitate such adjustments, as ComReg deems reasonably necessary, when another operator transitions a block from one technology to another.

It is noted that the manifestation of these issues will not be known until the outcome of the auction, and in particular: whether Meteor successfully avails of the early liberalisation option envisaged under Modified Option 1; and the nature of the technology sought to be deployed by operators in adjacent blocks.

In ComReg's view, three different scenarios are apparent and these are set out below.

Meteor avails of the early liberalisation option and wins 2 × 10 MHz at auction

In this instance, irrespective and regardless of where its final frequency assignments lie in the band, Meteor, in common with other licensees with similar technology mixes, should be able to adopt a 'mixed use' approach thus mitigating any band-edge sharing issues.

Meteor avails of the early liberalisation option and wins a single block of liberalised spectrum in the 2011-2015 time frame

In this scenario, the early liberalisation option under Modified Option 1 would allow Meteor to determine whether to relinquish its existing GSM assignment in either Block C2 or Block D in "exchange" for it obtaining the liberalised 2 × 5 MHz block via the competition. However, the most likely scenario here is that Meteor would retain use of its assignment in Block D for GSM.

Consequently another licensee in Block E, deploying UMTS or similar technology, will have to observe the 2.8 MHz carrier separation requirement. This could have an impact on the neighbouring Block F depending on whether or not it is licensed to the same operator as Block E and whether or not Block F is to be used for GSM or UMTS technology. Should the Block E licensee decide to deploy GSM, at least until 2015, then the above issue does not arise, otherwise it would be appropriate to adjust Meteor's frequency assignments in blocks D and C down in frequency by 200 kHz.

Meteor's use of Blocks C and D remains unchanged in 2011-2015

In the event that Meteor chooses not to avail of the liberalisation option before 2015, or alternatively does avail of the option but fails to win any spectrum in the 2011-2015 time frame, then the same issues identified above would apply - but only in respect of Block E and above (as there would be sufficient separation between Block C2 and Block B as Block C1, which would remain fallow, would effectively operate as a guard band between Block C2 and Block B). Again, if necessary, shifting Meteor's frequency assignments in blocks D and C down in frequency by 200 kHz would avoid potential interference into block E.

14.3 Implications of Meteor's existing GSM 900 MHz assignment under Modified Option 1 and potential concerns

The above discussion is not meant to be exhaustive in terms of the possible scenarios that could occur in an auction under Modified Option 1 if no preventative measures were taken in advance of the auction.

Nevertheless, it is apparent, in the event that Meteor did not fully successfully avail of the early liberalised option under Modified Option 1, that there is the potential for a number of adverse consequences for efficient spectrum use in the wider band and in terms of the ability of the proposed auction to obtain spectrally and economically efficient outcomes.

In relation to efficient spectrum use, ComReg is concerned that, unless proportionate, preventative measures are taken, the use of Blocks C and/or E and potentially other blocks in the 900 MHz band, could be impaired for the provision of advanced new services during the period 2011 to 2015, thereby denying consumers timely access to advanced services provided through these blocks.

Similarly, absent proportionate and preventative measures being taken, ComReg would also note the following primary concerns in relation to the efficiency of the proposed auction and its outcomes:

- the potential impairment of Block C and/or Block E, in particular, would mean that not all blocks available in the main stage of the proposed auction would be homogenous and, in effect, a heterogeneous lot category would need to be introduced;

- if a heterogeneous lot category were created for Block C and/or Block E, then this could create a significant advantage for existing GSM licensees as these bidders would have the option to use Block C and/or E for GSM until the expiry of Meteor's GSM licence, whereas a new entrant (which would likely be seeking to deploy UMTS in Block C and/or E) would bear significant coordination risk during this period and potentially be constrained in UMTS use in the absence of coordination;

- a combination of the above two factors may result in the acquisition of Block C and/or E for GSM use by existing GSM licensees at artificially low prices, thereby distorting the value of Block C and/or and E in the auction, reducing the efficiency of outcomes under the auction and potentially lead to distortion of competition more generally;

- the potential impairment of Block C and/or Block E for 3G use may artificially increase the value of other blocks in an auction. This may result in bidders paying artificially high prices for access to a reduced number of blocks in the band (i.e. those that would not be so impaired for UMTS use). This would reduce the efficiency of outcomes under the auction and potentially lead to distortion of competition more generally;

- the increased complexity of the auction process that would be required to mitigate the uncertainty surrounding the use of Block C and/or Block E, absent proportionate and preventative measures, would generally increase the likelihood of an inefficient auction outcome; and

- the above factors could create opportunities for gaming, tacit collusion and other strategic behaviour to exploit the introduction of an "impaired lot" category into the auction design, thereby increasing the risk of the auction resulting in an inefficient outcome and potential distortions to competition more generally.

14.4 Potential Measures and Proportionality

In light of the previous discussion, ComReg considers there to be a number of potential options to address the identified potential concerns.

One option could be for ComReg to do nothing at this stage and await the outcome of the proposed auction to determine what intervention measures would be required, in the event that any coordination between Meteor (assuming it did not successfully avail of the early liberalisation option) and affected licensees, to ensure compliance with the EC Decision and efficient use of spectrum, was not sufficient. While such an *ex-post* approach may seem ideal, given the uncertainty of outcomes which could result in non-compliance and inefficient spectrum use, it would not, in ComReg's view, address the primary concerns set out above in relation to the efficiency of the auction and its outcomes. In particular, if no preventative and proportionate measures were taken prior to the auction, then it would be necessary to introduce heterogeneous lots into the auction format. This would increase coordination risks for bidders and increase the higher likelihood of inefficient auction outcomes and distortions to competition across the entire 900 MHz band. In ComReg's view, such an approach would not be in the furtherance of its statutory functions and objectives and is, therefore, not countenanced further.

Another potential option, albeit in the other extreme, would be to implement *ex ante* measures prior to the auction to remove the possibility of inefficient spectrum and auction outcomes, irrespective of the possible outcomes of the auction. In light of the known parameters of Meteor's existing GSM assignment and the inherent uncertainty of the auction and post-auction outcomes, such an approach would likely involve modification of Meteor's existing GSM assignment to ensure that all future licensees in the band would be protected from inefficient spectrum use and so as to avoid the inefficient auction concerns identified above. Thus, such an option could involve obviating *ex ante* the potential consequences of the two scenarios identified above, such as by:

- requiring that any GSM spectrum retained by Meteor following the proposed auction could not be used within 200 kHz of the boundary of the block without the neighbouring licensee's consent; or

- moving Meteor's current assignment 200 kHz away from the upper edge of Block D.

It is recognised that these measures would be based on pessimistic assumptions about the potential auction and post-auction outcomes and, in this context, could involve significant inefficiency in how Meteor's existing assignment would be used. Although such measures would, in principle, be in the furtherance of ComReg's statutory functions and objectives, it is recognised that the implementation of such measures, in advance of knowing these outcomes, may raise issues regarding the reasonableness and proportionality of such an approach.

ComReg's preferred option would be to make clear, prior to the auction, what steps it would take in the event of certain outcomes that would result in inefficient spectrum use related to Meteor's existing GSM assignment. The purpose of providing such clarity would be to:

- provide visibility to all stakeholders of, and consult upon, the identified scenarios so as to set out the justification for and proportionality of ComReg's proposed measures;

- provide certainty to bidders in the auction process about the ability to make efficient use of future 900 MHz licences;

- maintain homogeneity of all blocks in the main auction stage and thereby avoid the potential primary concerns identified above regarding the efficiency of the proposed auction and its outcomes.

Clearly, whether ComReg would take such steps would depend on the outcome of the auction and subsequent events (such as the outcome of inter-operator frequency coordination and cooperation between Meteor and relevant licensees). While ComReg remains 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 must also provide regulatory certainty to all operators in the event that it does not, and also take appropriate steps to ensure that the proposed auction delivers efficient outcomes across the entire 900 MHz band.

Depending on the outcome of these events, the proposed potential measure envisaged by ComReg would be to require that any GSM spectrum retained by Meteor following the proposed auction and until licence expiry in 2015 would be subject to the obligation that it could not be used within 200 kHz of the boundary of the block without the neighbouring licensee's consent.

In the context of Meteor retaining Blocks C and D for GSM use post-auction, the application of the proposed potential measure would involve shifting Meteor's assignment in Block C and D down by 200 kHz into Block C1. ComReg would reiterate its hope that the circumstances requiring the implementation of the proposed potential measures would not come to pass. However, it considers that the proposed potential measures would, on balance, be objectively justified having regard to the potential concerns identified above, and proportionate in light of the available potential options by which to address the potential concerns currently apparent to ComReg.

14.5 Implementation Costs and Potential Compensatory Measures

ComReg recognises that the implementation of the proposed potential measure could result in Meteor either incurring retuning costs (shifting) or potentially not retaining full use of its existing GSM spectrum assignment (guard band in Block D).

Accordingly, ComReg does not put forward these proposed potential measures lightly, but does so informed by its current understanding of the likely costs of these proposed potential measures on Meteor[90] and, weighed against that, the potential costs of having one or more future 900 MHz blocks potentially impaired and the cost to society arising from inefficient auction outcomes.

Nevertheless, to fully inform its understanding of this issue, ComReg would welcome the following information from stakeholders:

- the nature and extent of costs to Meteor that would arise from the implementation of the proposed potential measures; and

- proposals as to 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.

14.6 Conclusion

In light of its statutory obligations under the Authorisation Regulations, ComReg hereby invites interested parties, including users and consumers, to make representations on all aspects of the proposed potential measures as part of this consultation process.

In this regard, ComReg seeks views from respondents to further its consideration of this issue.

[90] In connection with likely retuning costs, ComReg notes Vodafone's RIA submission (see Annex H of this document), in which it is stated that the costs that would be incurred in implementing Vodafone's preferred option would be "very low". This option, based on increasing each existing GSM licensee's assignment to 2 × 10 MHz, would implicitly require significant retuning of existing assignments. While Vodafone's precise cost estimate is confidential, it is ComReg's belief that this estimate would be substantially lower than the potential cost of having one or more 900 MHz blocks potentially impaired and the cost to society arising from inefficient auction outcomes.

Q.8.	**i) Do you agree that Meteor's continuing presence (within its current assignment of 892.7 - 899.9 MHz paired with 937.7 - 944.9 MHz) has the potential, depending on the auction outcome, to have a detrimental impact on future liberalised use of Block E or any other block in the 900 MHz band?** **ii) Do you agree with ComReg's proposal that, if the circumstances justify it, Meteor's assignment should be adjusted post-auction?** **iii) Are there any other issues which should be considered?**

Q.9.	**i) In the event that Meteor's existing frequency assignment must be adjusted post auction, please provide an estimate of the costs which might reasonably be incurred by Meteor in doing so?** **ii) Please identify any proposal as to 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.**

15 Licence Conditions and Potential Commitments

This section discusses the conditions that ComReg may seek to attach to licences for liberalised 900 MHz spectrum. The section has five main parts.

- Section 15.1 identifies the benefits of 900 MHz spectrum and the potential future benefits that this band can offer when liberalised;
- Section 15.2 considers the purpose of licence conditions and whether they are appropriate or necessary;
- Section 15.3 set out the regulatory framework for licence condtions identifies the key determining factors when considering the need to attach conditions to any future licences; and
- Section 15.4 considers a number of possible conditions that may be attached to liberalised 900MHz spectrum, having regard to the key determining factors.

In both previous consultations, ComReg stated that it would most likely attach conditions to licences for liberalised 900 MHz spectrum and in this regard Question 11 of Consultation 09/14 asked:

Q.11. of 09/14: It is ComReg's intention to include conditions in any new 900 MHz licences issued.

a. Should the conditions be limited to existing services such as voice and text or be broadened to include other services such as broadband?

b. What kind of conditions (e.g. Coverage, Roll-Out, Quality of Service, etc.) should be included?

c. At what level should these conditions be set? Please provide reasons for your views.

Over the course of both previous consultations and at the bilateral meetings, all respondents except one submitted views on licence conditions. These views ranged from the consideration of high level issues, such as the need for licence conditions, to more detailed issues such as the level at which a particular condition should be set. Throughout this chapter, the views of the respondents are referenced and considered as is the opinion of ComReg's economic consultants, DotEcon.

15.1 Current and Potential Future Benefits of the 900 MHz Band

The 900MHz band is currently reserved for GSM use only, the main services provided being voice and text. Three national GSM licences are held by Vodafone, O2, and Meteor and those three operators each provide similar degrees of population coverage (circa 97% to 99.5% population coverage). GSM services are thus available to almost the entire population of Ireland throughout almost the entire geographic country, via the 900 MHz band. The number of mobile subscriptions in Ireland is currently more than 4.8 million and, based upon a

population estimate of 4.4 million[91], Ireland's mobile penetration rate is 109%[92] with approximately 55% of all telephone calls made today being made with a mobile phone[93].

Ireland's high rate of mobile phone penetration is a result of several factors including the coverage provided by 900 MHz spectrum. With all other things being equal a 900 MHz signal will travel further than a higher frequency signal. This means that more subscribers can be accessed from a single base station using 900 MHz spectrum than can be accessed by using spectrum in the higher frequency bands. The greater the area covered by one base station, the lower the overall costs of building and maintaining an electronic communications network, which should in turn reduce the costs of providing electronic communications services. This benefits both operators and end users.

The 900 MHz spectrum band, even when limited to GSM use, holds key benefits for mobile operators in terms of geographic coverage and indoor penetration. When considered on a liberalised basis, the potential benefits are further magnified. Liberalised 900 MHz spectrum has the potential to vastly increase the provision of wireless electronic communications services throughout the State, including 3G mobile services which are currently only provided through 2100 MHz spectrum.

So, while ComReg's earlier consultations on GSM liberalisation spawned a wide variety of views, the benefits of liberalisation are not in dispute. For example, in its response to Consultation 08/57 one current licensee expressed a view which is consistent with many of the views that have been expressed during this process:

> *"We support ComReg's proposals to liberalise the existing GSM licences in the 900 MHz and 1800 MHz bands following entry into force of the EC Decision. The proposed introduction of a service and technology neutral approach to the spectrum in these bands, subject to harmonisation and interference concerns being addressed, offers the potential to deliver enormous benefits to Irish consumers and society. The liberalisation of spectrum rights of use in these bands is a necessary condition for the deployment of innovative and spectrally efficient UMTS technology which would facilitate the economical provision of advanced mobile broadband services with much greater geographic availability than at present."* [94]

Liberalised 900 MHz spectrum can benefit both operators and consumers. First, it should enable operators to provide more electronic communications services to consumers than is the case under existing GSM licences, and it should enable operators to develop innovative services. In particular, it is likely that mobile

[91] Central Statistics Office Data, April 2008.

[92] This excludes High Speed Downlink packet Access "HSDPA" subscriptions. Including HSPDA the mobile subscription penetration rates is 117%.

[93] ComReg (2009) "Irish Communications Market: Quarterly Key Data Report as of June 2009" ComReg Document 09/71.

[94] See page 2 of Vodafone response to consultation 08/57 in ComReg document 09/14s.

broadband services (similar to those provided by 3G licensees at 2100 MHz) will be provided in the 900 MHz band. Mobile broadband services are the fastest growing segment in Ireland's broadband market; in Q2 2009 there were over 370,000 mobile broadband subscribers which accounted for over 28% of all broadband subscriptions in Ireland[95]. A second foreseen benefit is the increased operating efficiencies and lower costs associated with 900 MHz spectrum, as it requires fewer base stations than would be required if one used higher frequency spectrum[96]. Providing more electronic communications services at lower costs should mean that the spectrum is being used more efficiently.

15.2 Licence conditions in the 900 MHz band

15.2.1 Views of Respondents

In both previous consultations, ComReg stated that it would most likely attach conditions to future licences for liberalised 900 MHz spectrum. Of the ten respondents on this issue, only one did not support ComReg's intention to attach conditions to future licences for liberalised 900 MHz spectrum. This respondent believed that the market alone should set the Quality of Service (QoS) standard and that speeds for mobile broadband will be based upon consumer demand.

All other respondents were supportive of ComReg's proposal to attach conditions to future licences. A number of these respondents noted the importance of 900 MHz spectrum to the provision of mobile services in Ireland and believed that licences should be designed to best benefit Ireland. One such respondent added that it believed that *"GSM is ubiquitous because that is what the licence conditions mandate"*.

15.2.2 ComReg's View

While ComReg generally agrees with views expressed by the majority of the respondents to this consultation and believes that it may be appropriate to attach conditions to future licences for liberalised 900 MHz spectrum, it is also necessary to consider whether such conditions are in fact required, or whether competition alone would result in high-quality, affordable electronic communications services for all users in the State.

In a competitive market, the need for regulatory intervention is reduced. However, even in a competitive market, there may have been market failures which regulatory intervention helped to address. Ireland has an overall low population density (60 persons per square kilometre) with the population concentrated on the central East coast and in certain other urban areas. ComReg notes the views of respondents as set out above and believes that the coverage and rollout conditions attached to current GSM licences have played an important part in ensuring that, in

[95] ComReg (2009) "Irish Communications Market: Quarterly Key Data Report as of June 2009" ComReg Document 09/71.

[96] A report prepared for ComReg by Vilicom in 2008 estimated that the use of 900 MHz, as opposed to 2100 MHz, could result in cost savings of 35% if the operator was to build a green field 3G network with an 80% Geographic and 95% Population coverage. See ComReg 09/14a.

spite of the geographic dispersal of the population, Irish mobile users enjoy nationwide mobile services. Without those conditions, mobile services might not be as widespread as they are, as providing coverage in areas of low population density might have been commercially unattractive to operators. ComReg therefore considers that in order to ensure that nationwide mobile services are maintained, it is appropriate to attach conditions relating to coverage and rollout to future licences for liberalised 900 MHz spectrum, a view generally supported by respondents to the consultation. Considerations regarding the quality and access of these services are also considered further in this section.

15.3 Framework for considering licence conditions

ComReg's functions and objectives in relation to spectrum and licensing generally are set out in Section 10 of this document.

In relation to conditions which may be attached to licences granted under the Wireless Telegraphy Acts (for apparatus for wireless telegraphy for the provision of an electronic communications network or service), the Authorisation Regulations require that such licence conditions be objectively justified in relation to the electronic communications network or service concerned, and be non-discriminatory, proportionate and transparent. Additionally, Regulation 10 of the Authorisation Regulations identifies the categories of licence conditions that may be attached (as listed in Part B to the Schedule of the Authorisation Regulations).

As noted previously, there have been very recent reforms to the European Common Regulatory Framework and these changes are required to be transposed by Member States into respective national legislation by June 2011[97] . These reforms include amendments to Part B of the Schedule of the Authorisation Directive. Noting that the precise nature of amendments to domestic legislation is not yet clear, ComReg has nevertheless considered potential licence conditions in the context of relevant amendments to the Authorisation Directive, including Part B of the Schedule of the Authorisation Directive.

Having regard to its relevant functions under Section 10 of the 2002 Act and as set out elsewhere, and its objectives under section 12 of the 2002 Act, and the Authorisation Regulations which require licence conditions to be objectively justified in relation to the electronic communications network or service concerned, non-discriminatory, proportionate and transparent, and other obligations, ComReg considers that the following are the key factors for determining the appropriate conditions for liberalised 900 MHz licences:

1. To ensure that all users in the State, including disabled users, derive maximum benefit in terms of choice, price and quality, from electronic communications services provided through liberalised 900 MHz spectrum.

[97] See: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/1812&format=HTML&aged=0&language=EN&guiLanguage=en and http://register.consilium.europa.eu/pdf/en/09/st03/st03677-re06.en09.pdf

2. To ensure that there is no distortion or restriction of competition in markets for the provision of electronic communications services using liberalised 900 MHz spectrum
3. To encourage the efficient use and effective management of liberalised 900 MHz spectrum
4. To encourage efficient investment in infrastructure, and to promote innovation, by licensed users of liberalised 900 MHz spectrum encourage.

In certain circumstances the above factors may run contrary to one another. In such cases, ComReg considers that it is obliged to identify a solution that achieves a reasonable balance. This Section evaluates the possible licence conditions under five headings:

1. Technology neutrality
2. Service neutrality
3. Coverage and roll-out
4. Quality of service
5. Other conditions, including roaming, non-ionising radiation, and access to the emergency services

In considering the attachment of licence conditions, other than conditions that are considered to be mandatory and/or common across many licence types, ComReg has set out, in this document, a draft RIA for the consideration of interested parties.

15.4 Technology Neutrality and Service Neutrality

15.4.1 Technology Neutrality

In accordance with the technical harmonisation conditions set down in the EC Decision, the Amending Directive obliges Member States to make 900 MHz spectrum available for GSM and UMTS systems, as well as other terrestrial systems that can co-exist with GSM systems. Article 1(1) of the Amending Directive states:

> *'Member States shall make the 880-915 MHz and 925-960 MHz frequency bands (the 900 MHz band) available for GSM and UMTS systems, as well as for other terrestrial systems capable of providing electronic communications services that can coexist with GSM systems, in accordance with technical implementing measures adopted pursuant to Decision No 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community (Radio Spectrum Decision);'*

As discussed in ComReg's two previous consultations, ComReg intends to apply the principle of technology neutrality to any new licences for liberalised 900 MHz spectrum. This will enable the deployment of terrestrial systems which are compatible with the Amending Directive and EC Decision.

With the exception of one respondent to the 08/57 consultation, all respondents to ComReg's consultations and bilateral meetings were in favour of this technology neutral approach as it will afford licensees the greatest opportunity to benefit from

technological advances. The one respondent who submitted a differing view requested that certain conditions be attached to existing GSM technology in order to ensure its long term availability and obtain a reasonable period of notice before this technology is switched off.

ComReg is of the view that applying the principle of technology neutrality to the 900 MHz band will facilitate the maintenance of any technology, including GSM, provided that that there is sufficient incentive for an operator to maintain that technology. Decisions on technology deployments are best left to licensees who will act in response to market forces and overall network management requirements.

15.4.1.1 ComReg's View

ComReg proposes to adopt the technology neutral approach as espoused by the Amending Directive and EC Decision when issuing licences for liberalised 900MHz spectrum and not require the deployment of a particular technology.

Q.10.	**Do you agree with ComReg's technology neutrality proposal which does not mandate the deployment of any particular technology?**

15.4.2 Service Neutrality

Service neutrality is a general principle that has been adopted by Ireland and other European Member States for a number of years under the Wireless Access Policy for Electronic Communications Services ("WAPECS") framework[98]. The WAPECS framework encourages efficient investment and innovation by removing restrictions on the types of electronic services that may be offered in a particular spectrum band. In Consultation 09/14, ComReg stated that it considers it appropriate to apply the principle of service neutrality to licences for liberalised 900 MHz spectrum, provided that the services offered comply with the Amending Directive and EC Decision. The Amending Directive states that the 900 MHz band is to be made available to terrestrial systems capable of providing electronic communications services that can co-exist with GSM systems. ComReg intends granting licences that will allow for this wide scope in accordance with Regulation 10 of the Authorisation Regulations which *inter alia*, identifies the categories of licence conditions that may be attached (as listed in Part B to the Schedule of the Authorisation Regulations) and the proposed reforms to the Authorisation Directive.

However, in implementing a service neutral approach ComReg must also consider whether it is appropriate to include any licence condition that explicitly requires the provision of a particular service. In this regard, Article 4 of the draft EC WAPECS Recommendation states that the designation of a specific service may be appropriate where it is "*duly justified and necessary for pursuing general interest*

[98] RSPG05-102 "RADIO SPECTRUM POLICY GROUP (RSPG) OPINION ON Wireless Access Policy For Electronic Communications Services (WAPECS)" http://rspg.ec.europa.eu/_documents/documents/opinions/rspg05_102_op_wapecs.pdf

objectives in conformity with Community Law" and "*such a designation should not constitute an exclusion of other electronic communications services*"[99].

This section focuses on the three principal services that are currently provided in the mobile market - mobile voice call, mobile messaging, and mobile broadband data - with a view to determining whether it would be appropriate to mandate the provision of one or more of those three services under future licences for liberalised 900MHz spectrum. In assessing this, ComReg will first consider the benefits and market trends of each service.

Mobile voice call services are the mainstay of the mobile industry. They allow private and business customers to communicate from almost any location, which leads to increased efficiencies in business, improved social inclusion and cohesion, and near-ubiquitous access to the emergency services. The majority[100] of calls to the emergency services are carried over mobile networks and approximately 55% of all telephone calls made today are made with a mobile phone[101]. While voice services are not explicitly mandated in the existing GSM and 3G licences, they are implicitly[102] and hence consumers were historically guaranteed access to voice call services. A service neutral approach to issuing future licences could remove this guarantee.

In addition to mobile voice call services, the GSM licensees also offer related services such as messaging (e.g. SMS, MMS) and supplementary services (e.g. Voicemail, call management, etc.). While these services are not as important to safety or daily life as voice calls, they are nonetheless valued by consumers. For example, some three billion SMS messages were sent by Irish mobile users in Q2 2009 alone[103].

Mobile broadband services were launched by the 3G licensees in 2006, and since then they have grown significantly and as of June 2009 there were over 370,000 mobile broadband subscriptions in Ireland[104]. The benefits of mobile broadband services are varied and studies[105] have shown that the wide availability of

[99]Source:http://ec.europa.eu/information_society/policy/ecomm/radio_spectrum/_document_storage/rsc/rsc23_public_docs/rscom08-16%20results%20wapecs%20recommendation.pdf

[100] Assessed on the basis of confidential MNO submissions.

[101] ComReg (2009) "Irish Communications Market: Quarterly Key Data Report as of June 2009" ComReg Document 09/71

[102] The GSM licences explicitly mandate other voice related services, such as voice mail, call waiting etc and stipulate voice based measurement criteria for evaluating compliance with QoS licence condition.

[103] ComReg (2009) "Irish Communications Market: Quarterly Key Data Report as of June 2009" ComReg Document 09/71

[104] ComReg (2009) "Irish Communications Market: Quarterly Key Data Report as of June 2009" ComReg Document 09/71

[105] New Zealand Institute

http://www.nzinstitute.org/Images/uploads/Broadband%20aspiration%20Sept%202007.pdf

broadband can lead to productivity gains and innovation. The favourable propagation characteristics of 900 MHz spectrum, when liberalised, would allow operators to cost-effectively deploy nationwide mobile broadband services and mandating the provision of mobile broadband services would ensure that consumers have access to those services.

However there are also a number of potential drawbacks associated with mandating a service and it may be unnecessary if the market is likely to provide this service itself. The main drawback is that it reduces the flexibility of the market to respond to consumer demand and may even deter new market entry. The mobile market is dynamic by nature with innovative technologies and service offerings evolving over relatively short timeframes. This makes it difficult to anticipate trends in consumer demand over the duration of a licence and if at some point in the future, consumer demand for a given service were to diminish, then a requirement for the ongoing provision of that service may be costly and inefficient. Similarly a potential new operator may be deterred from entering the market if the licence mandates the provision of a service which the operator did not wish to provide.

It may also be unnecessary to mandate provision of a service if it is likely that the market will provide the service in any case. In a competitive market, operators will strive to maximise revenue by offering services for which there is reasonable market demand.

Consumer demand continues to grow for existing voice call and messaging services and currently it is estimated that 76%[106] of the Irish mobile operators' revenue is generated by voice call services, while SMS traffic on the Irish networks grew by 22% in the last year[107].

Similarly, mobile broadband services continue to grow and become more important in the portfolio of mobile services. In Q2 2009, 56% of all new broadband subscriptions were mobile connections and 28% of all broadband subscriptions in Ireland are provided via mobile[108]. There is room for further growth in the broadband market, as Ireland has circa 57% household broadband penetration but this figure is close to 80% in some other European countries.

15.4.2.1 ComReg's View

There are three principal services currently provided in the mobile market - mobile voice call, mobile broadband, and mobile messaging. Mandating the provision of a service would guarantee its availability from each new 900 MHz licensee. However, there may be drawbacks associated with mandating services, and given

---

Crandall and Jackson The $500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access
http://www.att.com/public_affairs/broadband_policy/BrookingsStudy.pdf

[106] Source: Data provided by Informa for EU markets as at Q2 2009

[107] ComReg (2009) "Irish Communications Market: Quarterly Key Data Report as of June 2009" ComReg Document 09/71

[108] ComReg (2009) "Irish Communications Market: Quarterly Key Data Report as of June 2009" ComReg Document 09/71

current market trends it seems unlikely that a situation would arise in which future licensees would decide not to offer mobile voice call, messaging or broadband service, as these are likely to remain the core services for which there is consumer demand.

Accordingly, ComReg believes that it is not necessary to mandate the provision of a particular service in any future licence for liberalised 900 MHz spectrum, and is minded to adopt an entirely service neutral approach.

Q.11.	**Do you agree with ComReg's service neutrality proposal which does not mandate the provision of any particular service or services?**

15.5 Coverage and Roll-out

A coverage obligation ensures that services are provided over a particular geographic area or to a certain proportion of the population, while a roll-out obligation is often imposed simultaneously to ensure that the coverage obligation is met in a specified period of time. These two obligations are among the most important conditions which can be attached to spectrum licences. Additionally, coverage obligations are specifically mentioned in Part B of the Schedule to Authorisation Regulations and the proposed reforms to the Authorisation Directive.

15.5.1 Views of Respondents

Nine respondents provided submissions on coverage and roll-out conditions, as summarised in this section. Seven of the nine respondents supported the inclusion of coverage and roll-out obligations in licences for liberalised 900 MHz spectrum. One remaining respondent, that expressed a view in this regard, supported a condition that would ensure that the spectrum is brought into use, being a condition postulated to be similar in effect to a coverage and roll-out obligation.

Seven of the eight respondents who supported the inclusion of coverage and roll-out obligations also provided views on the appropriate level for such conditions. These ranged from the setting of an indoor coverage target that would cover the least served 50% of the State (which would lead to *de facto* nationwide coverage) to the setting of a minimum coverage level that would ensure the efficient use of the spectrum which one respondent equated to an obligation to cover 53% of the population; the remaining respondents suggested various coverage levels falling between these two. One respondent suggested that the coverage requirements should be set to a level that is consistent with the service provided - i.e. if 3G services are deployed then the licence should reflect the 3G licence holder's obligations. Another respondent suggested that coverage should be set to a level that is higher than that set under current 3G licences. Another respondent suggested that coverage could be set to a level consistent with the current GSM licence conditions. The final respondent on this issue believed that in the short term there may be justification for a carry-over of the existing GSM coverage conditions, but

the continued imposition of such coverage conditions should be reconsidered by ComReg if the licences are later modified to permit spectrum trading.

Some of the respondents raised an additional issue and believed that any licence conditions should be set on a frequency neutral basis, as mobile networks will use the multiple frequency bands (900 MHz, 1800 MHz, 2100 MHz and other bands in the future) at their disposal to provide mobile services to consumers.

15.5.2 ComReg's view

The majority of respondents supported the inclusion of minimum coverage conditions in future licences for liberalised 900 MHz spectrum, although they were less forthcoming on suggestions for roll-out targets. ComReg believes that setting appropriate coverage and roll-out obligations can ensure the efficient use of the 900 MHz band by ensuring that the spectrum is used to deploy services to wider geographic range than may otherwise be the case. Such obligations would also contribute to the widespread availability of open-access, affordable, always on, broadband infrastructure and services for businesses and citizens. However, not setting any such conditions is also an option and is considered in the draft RIA below.

A wide range of levels of coverage were suggested by all respondents bar one who did not favour any coverage conditions. The suggested coverage levels fell between a "low" of 53% of Ireland's population and a "high" of 100% geographic coverage. This suggests that if it is appropriate to set a coverage obligation, then the appropriate coverage level is likely to lie between these "low" and "high" levels.

The remaining issue submitted by the respondents is the use of multiple frequency bands to meet an obligation. ComReg agrees that mobile services are now generally delivered over multiple frequency bands and consumers are indifferent to the frequency which the service is provided over. ComReg believes it is appropriate to consider this issue in relation to any new 900 MHz licence conditions and this issue is addressed further below.

15.5.3 Draft RIA

While the majority of respondents supported the inclusion of coverage and roll-out conditions of some form, ComReg has undertaken a draft RIA to consider whether such conditions are necessary or appropriate. One could argue that there is no need for such conditions on the ground that market forces will drive demand for coverage. However, one could also argue that coverage and roll-out conditions play an important role in developing and maintaining competition in the market, and ensuring timely availability of services to consumers, and that it is therefore appropriate and necessary to impose such conditions in any future licences for liberalised 900 MHz spectrum.

RIA ON COVERAGE AND ROLL-OUT OBLIGATION

Step 1: Identify the policy issue and identify the objectives

The policy issue to be addressed is a concern that operators issued with new 900 MHz licences may not use those licences to roll out services across an acceptable geographic area or in a timely manner, and that this may not be in the interests of consumers.

ComReg's objectives, insofar as the promotion of competition is concerned are as follows:

- To encourage the efficient use and effective management of spectrum
- To ensure that all end users, including disabled users, derive maximum benefit in terms of choice, price and quality
- To encourage efficient investment in infrastructure and promote innovation
- To ensure there is no distortion or restriction of competition in markets for the provision of electronic communications services.

Step 2: Identify and describe the regulatory options

ComReg has identified the following options

Option 1: Impose no obligation on coverage

Option 2: Impose an obligation to provide a coverage level over a roll-out period

Step 3 & 4: Determine the impacts on stakeholders and the impacts on competition

OPTION 1: NO COVERAGE AND ROLLOUT OBLIGATION		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS	In a competitive market, the lack of coverage obligations will not negatively impact on the provision of coverage in densely populated areas as all operators will have a commercial incentive to cover these areas.	The provision of coverage in some geographic areas which have a low population density and/or where there is low/sporadic demand for coverage may be delayed or may not occur at all. By not setting coverage obligations, this could make it more difficult for consumers to compare operators' claims of what level of coverage they offer, as there may be no independent verification of these claims.
IMPACT ON INDUSTRY STAKEHOLDERS	Operators would have full flexibility to determine how extensive their network coverage would be. Operators could choose to only rollout their networks so as to only provide coverage in densely populated areas. This would result in lower network rollout costs (e.g. the number of base stations) than if larger geographic areas were covered. Operators could also choose to differentiate themselves and offer a higher level of coverage. This could result in other operators matching or exceeding higher levels of coverage.	
IMPACT ON COMPETITION	In a competitive market, competition between operators may result in some operators choosing to rollout their networks to wider areas than their competitors as a means of differentiating themselves. Operators could compete on the basis of providing a specified level of coverage, and advertise the fact that this is more than any other operator in the market. This could result in other operators matching or exceeding higher levels of coverage. The market is likely to	The development and maintenance of competition is at the full discretion of the market. Competition may be focused on the densely populated areas and this may result in a reduced level or no competition in the other areas.

OPTION 1: NO COVERAGE AND ROLLOUT OBLIGATION		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
	stabilise at a level of coverage where there is no incentive for any operator to increase their coverage above this level.	

OPTION 2: A COVERAGE AND ROLLOUT OBLIGATION OF A CERTAIN PERCENTAGE		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS	A coverage and rollout obligation would offer greater protection for consumers who would then be guaranteed the provision of mobile services in a specified minimum percentage of the geographic area of the country in a specified period of time, rather than leaving it at the discretion of the operators. This should increase the probability of services being available to rural consumers. The minimum coverage requirements of each operator would be independently verified by the regulator.	By requiring a minimum coverage requirement consumers could face higher prices if coverage obligations are set over and above what an operator would choose to offer. These additional costs would be passed onto consumers. Some customers who do not value high coverage will have to pay more as a result of the operator's obligation to provide coverage over and above what they would choose to offer.
IMPACT ON INDUSTRY STAKEHOLDERS	Provided the coverage level is set to an appropriate level within an appropriate timeframe, the business plans and investment decisions of operators should not be unduly affected. If operators are allowed to use their full spectrum holdings to meet a 900 MHz coverage obligation, this would provide greater flexibility to certain operators to meet coverage and rollout obligations and minimises the disadvantages of such conditions for the operators. Given the high coverage requirements set under the GSM licences for voice services (between 90-98% population coverage), and the fact that these requirements are being met and exceeded by the respective GSM licensees, these operators would seem to have little difficulty in meeting a similar coverage requirement for a new	Setting minimum coverage requirements may impact on the business decisions of operators if such obligations are out of line with what the operator would choose to do independently. Operators would have less control over when and how they roll out their networks. If the coverage obligation required reaching a coverage level that was too high or that had to be reached in an overly ambitious timeframe, this could lead to an unnecessary burden. Operators may face penalties if coverage and rollout levels are not met. If operators are allowed to use their full spectrum holdings to meet a 900 MHz coverage obligation, this would provide greater flexibility to certain operators and minimise the disadvantages of such conditions for

OPTION 2: A COVERAGE AND ROLLOUT OBLIGATION OF A CERTAIN PERCENTAGE		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
	liberalised 900MHz licence. If the 3G operators are allowed to use their 2100 MHz spectrum to meet a 900 MHz coverage obligation, give the fact the 3G 2100 MHz licence conditions are currently being met and exceeded by the respective 3G licensees, these operators would seem to have little difficulty in meeting a similar coverage requirement for a new liberalised 900MHz licence.	the operators. However operators who do not have other spectrum holdings would have to meet the requirements using only 900MHz spectrum.
IMPACT ON COMPETITION	The business plans of all potential licensees, including new entrants, are likely to plan for a certain level of network investment and coverage. Provided the minimum specified percentage coverage requirement is comparable to this level, a coverage obligation is unlikely to negatively impact on competition.	New entrants to the band would have to rollout a new network. If a coverage requirement is set which is out of line with the new entrant's investment plan, this could render their strategy infeasible. Therefore coverage obligations could potentially dampen competition within the auction or make a new entrant less aggressive as they are tied to meeting coverage requirements and network build rather than customer acquisition. If the coverage level is set to an inappropriate level, the competition for a new 900 MHz licence may be reduced as some potential licensees may not be able to meet this requirement.

Step 5: Assess the impacts and choose the best option.

If ComReg does not set any coverage obligation then consumers in low population density areas will not have any certainty of services being available to them. In such circumstances, it is likely that operators would only provide coverage to that part of the population for which it is considered commercially viable, i.e. where there is a commercial incentive to extend the network and offer services. Ultimately, the level of competition in the market will determine the extent of the coverage that operators will provide. If high coverage is considered by consumers to be an important factor, then operators may have an incentive to compete on this differentiating factor by offering coverage levels above that of their rivals in order to gain a competitive advantage.

However, even in a highly competitive market there is no guarantee that competition will deliver and maintain an acceptable level of coverage across the country that is in line with consumer expectations, or that this coverage would be provided in a timely manner. At a certain point, markets tend to settle on a certain coverage level. If the level of coverage achieved through competition alone is deemed acceptable then coverage obligations are not required. However if this level of coverage is not deemed to be acceptable, and if ComReg wants to ensure that consumers enjoy services in at least the minimum specified percentage level of the country, then regulatory intervention is required in the form of a licence condition specifying a certain minimum level of coverage.

ComReg considers there are reasonable grounds for setting coverage and roll-out conditions in future licences for liberalised 900 MHz spectrum as a safeguard to ensure that consumers are provided with an acceptable level of coverage and that this coverage is maintained. (i.e. Option 2).

Q.12. Do you agree that it is appropriate that coverage and roll-out licence conditions should be included in future licences for liberalised 900 MHz spectrum?

15.5.4 Specifics of the proposed coverage and roll-out licence condition

Having regard to the ComReg's statutory functions and objectives and the conclusion of the draft RIA, ComReg considers it appropriate to impose coverage and roll-out conditions in future licences for liberalised 900 MHz spectrum. The details of this proposed condition are set out in this section under the following headings:

- Coverage definition
- Symmetric or Asymmetric Conditions
- Coverage condition per single or multiple frequency bands
- Coverage and roll-out levels including the potential use of national roaming
- Penalties and Performance Guarantees

15.5.4.1 Coverage definition

In setting the level of coverage that shall be achieved by a licensee, either in terms of population or geographic area, it is important to set a level that is clear, easily measured, and which can be verified.

In the current GSM and 3G licences, coverage has been defined by reference to the distinct field strength level of each of the frequency bands. In the 900 MHz GSM licences, the required field strength level has been set to 46 dBµV/200kHz, while in the 3G licences it has been set to 58 dBµV/m/5MHz. An area is considered to be

covered when the requisite field strength level is present in over 95% of that area for 95% of the time.

The imposition of required signal strength levels has been successful in helping to define and measure the GSM and 3G coverage in Ireland. However, setting a coverage definition under a technology neutral licence is more difficult as many different technologies can be deployed and so it may not be possible, at the outset, to set a single field strength level that is equally appropriate to all possible technologies. ComReg has two options which are outlined below.

Option 1: Define coverage field strength levels according to each technology

In this scenario, the coverage definition for service would vary according to the particular technology that was deployed. For a GSM network, coverage would be defined by using the existing GSM licence obligation of 46 dBµV/m/200 kHz, while a 3G network coverage would be defined by the 3G licence obligation of 58 dBµV/m/5MHz. As new technologies are deployed in the band (e.g. LTE, WiMAX), the appropriate signal strength levels for these technologies would be set, by ComReg, so that the provision of voice call and mobile broadband services by that technology would be possible.

The advantage of this option is that it proposes a coverage definition that is already in place for current GSM and 3G technologies. The disadvantage is that it is not future proof as new technologies may enter the band which require new field strength values.

Option 2: Define a single coverage field strength level for all technologies

ComReg has analysed the coverage field strength values of the existing GSM 900 (46dBµV/m/200kHz) and 3G (58dBµV/m/5MHz) licences with a view to determining if a single field strength value could be defined that is appropriate for GSM, 3G and any possibly other technology that may enter the band.

As a GSM field strength level is measured over a 200 kHz channel and a 3G field strength level is measured over a 5 MHz channel, it is not possible to directly compare these levels without first converting them to a common bandwidth using the following formula:

$$46\text{dB}\mu\text{V/m/200kHz} = 46 + 10\text{Log}_{10}\,(5\text{MHz}/200\text{kHz}) = 60\text{dB}\mu\text{V/m/5MHz}$$

When now compared, it appears that the difference between the GSM field strength level (60dBµV/m/5MHz) and the 3G field strength (58dBµV/m/5MHz) level is minor and it may therefore be possible to set a single field strength level at the lower value of 58dBµV/m/5MHz, provided that this lower field strength value is sufficient to provide GSM services, and this value is converted back to the relevant bandwidth for measurements purposes (e.g. 200 kHz for GSM). Field strengths for other bandwidths could then be scaled accordingly[109].

[109] For systems with a working bandwidth other than 5 MHz (e.g. GSM) the coverage threshold may be revised to that to that XMHz bandwidth using the formula "$58 + 10\text{Log}_{10}$ (XMHz/5MHz)".

While Option 2 proposes a single field strength signal level that is scalable to other bandwidths, it also has a number of drawbacks. Firstly it is not clear that GSM services could be provided with this slightly lower field strength value, and secondly it is not clear that the proposed single field strength value would be relevant to all new technologies that may be provided in this band.

ComReg's View

On balance, ComReg believes that Option 1 is more appropriate and therefore proposes the following.

For GSM Technology:

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

For 3G Technology:

- For measurement purposes – an average field strength of 58 dBµV/m/5MHz measured outdoors at a height of 1.5m
- For propagation prediction systems – a field strength of 58 dBµV/m/5MHz over 95% of the area during 95 % of the time.

For Other Technologies:

- For measurement purposes – an average field strength of "X" measured outdoors at a height of 1.5m
- For propagation prediction systems – a field strength of "X" over 95% of the area during 95 % of the time.

The value of "X" will be set by ComReg to a level that is sufficient for the provision of services with this technology in a manned that is objectively justified, proportionate and non-discriminatory.

Q.13.	**Do you agree with ComReg's proposal to define a distinct field strength level for each type of technology deployed in the liberalised 900 MHz band?**

15.5.4.2 Symmetric or Asymmetric Coverage and Roll-out Conditions

This section considers whether coverage and roll-out conditions should be the same for all new 900 MHz licences or whether it may be appropriate to have varying conditions for different licensees. DotEcon have considered this issue in Sections

14.4.7 and 15.1.3 of its report, and have expressed a preference for homogeneous or symmetric licence conditions as such conditions do not give rise to concerns of discrimination. However in arriving at this preference DotEcon also state that they do not expect the existing GSM operators to reduce their coverage should they be awarded new liberalised licences.

Notwithstanding DotEcon's view, ComReg believes that it is worthwhile considering this issue in further detail and ComReg considers that there are three types of potential licensee for liberalised 900 MHz spectrum: an existing 900 MHz licensee, an existing mobile network operator, and a new entrant.

- Existing 900 MHz licensees already deploy GSM networks and they all currently meet and exceed their existing GSM licence conditions. If any of those licensees obtain a licence for liberalised 900 MHz spectrum, then they will be in a position to use their existing GSM networks to meet the new coverage and roll-out conditions that will be imposed. It can thus be argued that these operators are in an advantageous position in comparison to other parties as they already possess 900 MHz networks and provide coverage that exceeds their existing GSM coverage obligations.

- If use of multiple frequency bands can be counted towards compliance with conditions in a new 900 MHz licence then mobile operators with, for example, 3G (2100 MHz) licences would also be in an advantageous position.

- A new entrant may not have access to an existing network and so would probably not have access to existing radio transmitter sites. As such, a new entrant would find it more difficult to meet coverage and roll-out obligation compared to the first two types of potential licensee described above.

With the three categories of licensee in mind, the arguments around symmetric or asymmetric coverage and roll-out conditions can be considered in the light of ComReg's objectives which are relevant to this section in so far as the promotion of competition is concerned.

From the perspective of promoting the interests of consumers and promoting competition, the application of asymmetric conditions would encourage the widest availability of services, particularly if they could be constructed so as to facilitate all three categories of licensee described above. If symmetric coverage and roll-out conditions were imposed, then they would have to be set at levels that suited any new entrant, who would require enough time in which to build a complete network. This could result in incumbent operators being required to meet coverage conditions that fall below the levels which they had already achieved under their existing licences. This could result in them reducing coverage in order to reduce costs.

The risks of an asymmetric approach diminish when one recognises that the existing GSM and 3G licences include asymmetric conditions and this has not

distorted competition – in fact differing coverage levels are used by MNOs as a differentiator in competing for customers. In addition, the downside risks of an asymmetric approach can be reduced by setting coverage and roll-out conditions that are reasonable and which take account of the network build costs that will be incurred by each potential licensee.

The challenge in setting coverage levels is not to set them too high so that they discourage investment in network infrastructure (particularly by new entrants), nor to set them too low so that they fail to act as an incentive to roll out services beyond high-population/low-cost areas. In meeting this challenge, which would appear to favour asymmetry in coverage levels, it should be borne in mind that the existing GSM and 3G operators have existing network coverage, and should these potential licensees acquire liberalised 900 MHz spectrum under future competitions it is uncertain whether these operators will seek to reduce their coverage below their current levels.

ComReg's View

In considering whether to impose symmetric or asymmetric roll-out and coverage conditions in licences for liberalised 900 MHz spectrum, three categories of licensee have been identified. The analysis shows that each approach has its advantages and disadvantages.

ComReg invites views on the coverage conditions to be imposed on each of the three categories of potential new 900 MHz licensees: (1) existing 900 MHz mobile network operators, (2) existing non-900 MHz mobile network operators, and (3) a new entrant.

Q.14.	**In relation to each category of future new 900 MHz licensee - (1) existing 900 MHz mobile network operators, (2) existing non-900 MHz mobile network operators, and (3) new entrants - should there be symmetric or asymmetric coverage and roll-out conditions?**

15.5.4.3 Use of multiple frequency bands to meet coverage obligations

As already mentioned, a number of respondents to ComReg's consultations indicated that mobile services are now provided over multiple bands, and they suggested that coverage conditions should be service related and frequency neutral in order to allow operators the flexibility to optimise their spectrum holdings. This approach is also recommended by DotEcon in Section 14.4.1 of its report.

There is merit in this suggestion. To consider this issue it is helpful to assess the two options available to ComReg. Option X would be to continue using the existing practice of setting a coverage obligation relative to a specific technology and

frequency band[110], i.e. the 900 MHz band, while Option Y considers measuring coverage over multiple frequency bands.

From a consumer's perspective, it can be argued that the use of multiple frequency bands provides a better service as a network operator has more resources at its disposal and can therefore select the best frequency band to serve the needs of its customers. On the other hand, it can also be argued that the consumer may experience a worse service as the handover between the multiple frequency bands may not be seamless and the service quality associated with each frequency band may also vary. Overall this may result in quality issues when moving from one frequency band to another. However network operators can address such quality through network design and deployment. If such steps are taken, then ComReg believes that consumers would be indifferent to the frequency band that is used to provide the service.

In relation to the efficient use and effective management of spectrum, it appears that Option X offers greater advantages than Option Y as it would require the licensee to use 900 MHz spectrum. Without this obligation, there is always the possibility that the 900 MHz band will not be put into use, as the licensee may use its other frequency holdings to meet the conditions of its licence. However, given the very favourable propagation characteristics of 900 MHz spectrum band and the upfront and annual spectrum usage fees, this is most unlikely to occur.

In relation to encouraging efficient investment in infrastructure and promoting innovation, Option Y has the greater benefits as it allows an operator the flexibility to optimise the use of its multiple spectrum holdings and infrastructure in order to provide an optimum service to consumers. Under Option X, an operator maybe forced into inefficient investment in 900 MHz spectrum in order to meet a coverage obligation.

The final issue to consider is the potential distortion or restriction of competition. Option X appears to raise few concerns on this issue, as all new 900 MHz licensees would be in a similar situation as they would all have access to the 900 MHz band. Option Y is somewhat more contentious given the current asymmetric spectrum holdings[111]. This could be mitigated through the setting of an appropriate coverage level for licensees who only have access to the 900 MHz band.

ComReg's View

ComReg considers that the benefits of Option Y (the use of multiple frequency bands) outweigh its drawbacks. ComReg therefore proposes to permit future

[110] In the existing GSM and 3G licences the coverage obligations are defined in relation to the 3G or GSM coverage on a particular frequency band or bands. The 3G licence has a 2100 MHz coverage obligation, while the GSM licence has a combined 900 MHz and 1800 MHz coverage obligation as well as a separate 1800 MHz obligation.

[111] The principle of using multiple frequency bands has already been established to some degree in the current GSM licences which contain a combined 900 MHz and 1800 MHz coverage obligation. However these licences were issued at a time when all GSM operators had symmetric holdings of spectrum in these two bands.

holders of liberalised 900 MHz spectrum to use multiple frequency bands in order to meet any coverage conditions imposed under those licences.

In identifying the other frequency bands that can be used in order to meet a coverage condition under 900 MHz licence, the key factor to consider is whether a seamless service is provided to users over these multiple frequency bands. Given current frequency assignments and technologies, ComReg proposes that coverage in the 1800 MHz band and the 2100 MHz band could count towards a 900 MHz coverage obligation. In future, it is likely that other frequency bands (e.g. Digital Dividend, 1800 MHz, 2300 MHz, 2600 MHz, etc.) may also be able to provide seamless services in conjunction with the 900 MHz band, and ComReg proposes to allow the use of these other frequency bands (as an when appropriately licensed) over the lifetime of the licence.

Q.15.	**Do you agree with ComReg's proposal to allow multiple frequency bands to count towards a 900 MHz band coverage obligation?**
Q.16.	**Apart from the 1800 MHz and 2100 MHz bands do you believe that there are other frequency bands (e.g. Digital Dividend, 2300 MHz, 2600 MHz, etc.) that can deliver seamless services in conjunction with the 900 MHz band and could be added over the lifetime of the licence to the list of multiple frequency bands?**

15.5.4.4 Proposed minimum coverage and rollout level

As outlined in Section 15.5.1 above, respondents suggested a range of different coverage levels between a "low" 53% of the population level to a "high" 100% nationwide geographic coverage level. This suggested to ComReg that the appropriate coverage level is likely to lie between these "low" and "high" levels. Apart from a proposal that the time period to achieve coverage at the current GSM levels should be 24 months, there was little comment on the roll-out element.

Setting an appropriate level for coverage and roll-out is important as setting coverage or roll-out conditions too high could deter potential operators from seeking new 900 MHz licences, while setting conditions too low could reduce competition or the efficient use of the spectrum, and most importantly it could result in portions of the population not receiving services under the licence. As such the correct balance must be struck.

In considering this issue, it is clear that consumers should benefit from high coverage levels and fast roll-out timeframes as the greater the area covered by an electronic communications services (ECS) provider, the more persons may receive

those services. Additionally, if similar levels of coverage are provided by a number of ECS providers then users can benefit from the improved choice quality and cost of services that should derive from higher levels of competition. However it is also important to ensure that conditions do not distort or restrict competition as setting coverage levels too high could discourage investment, while setting them too low could fail to incentivise the roll out of services beyond the low-cost areas.

It is also important to consider the role of national roaming in meeting a coverage obligation. Currently coverage via a national roaming agreement does not count towards a coverage licence obligation. However, two of the mobile operators in the Irish market have a national roaming agreement with another operator that allows these operators to provide its customers a service outside of their own network coverage area. This issue is further considered in this Section.

When setting a coverage obligation it is also appropriate to consider whether this should be set at a geographic or a population level. Both approaches are similar as they oblige the operator to provide coverage to a set level and when an operator is initially rolling out its network, both approaches would be effectively equivalent as an operator is likely to first target the high population density areas. While the existing GSM and 3G licences have mainly used population targets, the use of a geographic target has a number of advantages as noted by DotEcon in Section 15.1.9 of its report. One such advantage is that a geographic target mirrors the consumer use of the service who use their mobile phone over a wide area and not just in their homes.

To consider these issues further it is helpful to briefly outline the current status of each of the three categories of future 900 MHz licensee.

1. Existing 900 MHz mobile network operator

The current 900 MHz licensees (Vodafone, O2, and Meteor) all provide services based on GSM technology and Table 10 below shows the coverage conditions under their licences. All current 900 MHz licensees have deployed networks that exceed those minimum coverage conditions and consequently they would be in a position to meet a coverage condition that matched or exceeded their obligations under their current GSM licences. Additionally Meteor has a national roaming agreement with another operator that facilitates it in providing nationwide coverage to 97% of the population.

	Combined GSM 900 & 1800	**GSM 1800**
Vodafone	99% (Population) 92% (Geographic)	48% (Population)
O2	97% (Population) 90% (Geographic)	40% (Population)
Meteor	80% (Population)	33.34% (Population)

Table 10 Minimum coverage obligations in the existing 900 MHz GSM licences

2. Existing non-900 MHz mobile network operator

The second potential category is an existing mobile network operator which does not hold 900 MHz spectrum. At present Ireland has two types of mobile network operator, GSM and 3G. All GSM mobile operators have 900 MHz spectrum and therefore this section will only consider the 3G (2100 MHz) network operators.

There are currently four 3G operators and as with the three GSM licensees, the 3G operators have also exceeded the minimum coverage requirements required of them - see Table 11 below. Consequently, they should be in a position to meet a coverage obligation that exceed their current 2100 MHz coverage obligation, should coverage in the 2100 MHz band count towards a 900 MHz coverage obligation. Additionally H3GI has a national roaming agreement with another operator that facilitates it in providing nationwide coverage.

	Minimum 3G Requirement
Vodafone	85% (Population)
O2	90.2% (Population)[112]
Meteor	To be published on ComReg website
H3GI	85% (Population)

Table 11 Minimum coverage obligations of the 3G (2100 MHz band) licensees

Only one of these operators H3GI does not currently hold 900 MHz spectrum and therefore falls in this category.

3. New Entrants

The third category of potential 900 MHz licensee is the new entrant. This party would not come to the market with an existing GSM or 3G network which it could use to meet a coverage and roll-out obligation.

ComReg's View

ComReg believes that it should establish coverage and roll-out conditions that promote the interest of consumers and the efficient use of spectrum, while not distorting or restricting competition. As discussed in Section 15.5.4.2, ComReg had not concluded whether it is appropriate to set symmetric or asymmetric licence conditions for the three categories of potential 900 MHz licensee.

This section sets out ComReg's proposed minimum coverage and roll-out levels for each category or potential licensee. If symmetric conditions are imposed then the conditions would be imposed on a new entrant would be imposed on all licensees.

[112] ComReg 07/108 – O2 3G coverage assessment – Information Notice – 21 December 2007

1. Existing 900 MHz mobile network operators

Should an incumbent 900 MHz licensee obtain a licence for liberalised 900 MHz spectrum, it can use its existing 900 MHz network to meet its coverage obligation under that new licence and should the use of multiple frequency bands (1800 MHz and 2100 MHz) be permitted under that licence, then incumbent 900 MHz operators with such networks, will also be able to use these networks to meet their coverage obligations under the new licence. Given this, ComReg believes that an appropriate coverage and roll-out condition for licences for liberalised 900 MHz spectrum that are granted to incumbent 900 MHz licensees, would be to achieve and sustain a 90% geographic coverage within 3 years of the licence commencement date. A timeframe of 3 years is proposed as ComReg believes that this allows the operator a sufficient time to meet this obligation.[113]

Q.17.	**Provided that asymmetric coverage obligations are set in the 900 MHz competition, do you agree with ComReg's proposal that the existing 900 MHz mobile network operators should meet a minimum coverage level of 90% geographic coverage within 3 years of the licence commencement date?**

2. Existing non-900 MHz mobile network operator

Should an existing non-900 MHz mobile network operator (currently this only applies to H3GI) obtain a licence for liberalised 900 MHz spectrum, and should the aggregation of coverage across multiple frequency bands (1800 MHz and 2100 MHz) be permitted under that licence, then that incumbent operator will also be able to use its existing networks to meet its coverage obligations under the new licence. H3GI currently exceeds its 85% population coverage obligation and is rolling out its network to the last 10% of the population under the national broadband scheme.

ComReg is therefore of the view that an appropriate coverage and roll-out condition for this category of licensee would be to achieve and sustain 90% geographic coverage within 3 years of the licence commencement date.

[113] Generally a coverage milestone in the region of 2 to 3 years have been used as the first coverage milestone timeframe in most spectrum competitions as it strikes a balance between allowing the licensee an opportunity to build out its network while also ensuring that services are provided to consumers in a timely manner.

Q.18.	**Provided that asymmetric coverage obligations are set in the 900 MHz competition and the aggregation of coverage across multiple frequency bands is allowed, do you agree with ComReg's proposal that the existing mobile (non-900 MHz) network operators should meet a minimum coverage level of 90% geographic coverage within 3 years of the licence commencement date?**

3. New Entrant

Should a New Entrant obtain a licence for liberalised 900 MHz spectrum it would not have access to any existing GSM or 3G network which it could use to meet its coverage and roll-out obligations. Consequently, such a licensee would require more time to meet its coverage and roll-out obligations, as compared to the other two categories of licensee.

In considering an appropriate coverage and roll-out obligation for this category of licensee, ComReg takes note of:

- DotEcon's recommended coverage range.
  - 25%-35% population coverage within 3 years and
  - 50%-70% population coverage within 5 years.
- The views of respondents which ranged from a "low" of 53% population coverage to a "high" 100% nationwide coverage.
- The existing coverage of the GSM 900 MHz networks.
- The existing coverage of the 3G networks and the fact that the 3G networks now cover >90% population (~70% geographic) 7 years after issue of licences using spectrum in the 2100 MHz bands whereas spectrum in the 900 MHz band has better propagation properties both in terms of geographic coverage and building penetration.

ComReg therefore believes that an appropriate coverage and roll-out conditions for this category of licensee would be to achieve:

- 30% geographic coverage within 4 years of the licence commencement date;
- 70% geographic coverage within 7 years of the licence commencement date; and
- 90% geographic coverage within 10 years of the licence commencement date.

Q.19.	**Do you agree with ComReg's proposal that a new entrant should meet a minimum coverage level of 30% geographic coverage within 4 years of the licence commencement date, 70% geographic coverage within 7 years of the licence commencement date, and 90% geographic coverage within 10 years of the licence commencement date?**

National Roaming

In considering the above coverage and roll-out levels, ComReg is aware that two of the existing GSM and 3G operators currently have a national roaming agreement with another operator, which facilitates these operators in providing nationwide coverage. ComReg invites views on whether coverage via a national roaming agreement should be allowed to count towards a 900 MHz coverage obligation and if so, to what extent.

Q.20.	**Do you believe that coverage via national roaming agreements should be allowed to count towards a 900 MHz coverage obligation and if so, to what extent?**

15.5.4.5 Penalties and Performance Guarantees

In order to enforce a licence condition it is appropriate to have a range of credible and enforceable penalties which are appropriate in light of the non-compliance. Regulations 16 and 17 of the Authorisation Regulations 2003 (SI 306 of 2003) set out provisions relating to enforcement of licence conditions, including the suspension or revocation of licences. In addition, future licences for liberalised 900 MHz spectrum will be granted under Regulations made by ComReg pursuant to section 6 of the Act of 1926, and those Regulations will include enforcement provisions related to non-compliance with licence conditions. Existing GSM and 3G licences also contain a number of performance guarantees or financial penalties, where an operator is liable to forfeit monies in the event of failing to meet a specific licence condition. These performance guarantees were submitted via the competitive evaluation processes for those licences and overall, this combination has provided ComReg with a range of sanctions to be applied against an operator's non-compliance.

DotEcon, in Section 15.5 of its report, recognises that operators should face appropriate consequences if they fail to meet a licence condition and states that a performance bond guarantee of around €2 - 3 million may be appropriate for minor licence compliance breaches, which result in the loss of some or all of this bond.

ComReg's View

In any new spectrum licences where conditions are imposed, it is necessary to have a range of appropriate sanctions in the event of non-compliance with those conditions . Given the importance of coverage and roll-out conditions in the provision of services to consumers, ComReg proposes to include a performance guarantee of €2 million against the coverage and roll-out obligations.

Q.21.	**Do you agree with ComReg's proposal to include a €2 million performance guarantee against the coverage and roll-out obligations in any new 900 MHz licence issued?**

15.6 Quality of Service

Licence conditions which set quality of service (QoS) obligations assist in the achievement of the objectives set out at the start of this chapter. QoS conditions ensure that certain levels of quality are met and act as a safeguard for consumers against poor service quality. Most licences issued by ComReg to date, including the GSM and 3G licences, contain a variety of conditions relating to QoS. The GSM licences contain QoS obligations relating to the quality of voice calls, network availability and billing. The 3G licences contain QoS obligations relating to the minimum speed of mobile broadband services, as well as network availability, customer care and billing.

The proposed amendments to the Authorisation Directive specifically refer to QoS as does the recently amended EC Universal Services Directive and ComReg has taken these into account in this section.

15.6.1 Views of Respondents

Over the course of the consultations and bilateral meetings, nine respondents provided submissions on QoS. Six of the nine supported the inclusion of appropriate QoS conditions in licences for liberalised 900MHz spectrum (see question 11 of ComReg 09/14).

A range of views was submitted as to what they considered to be appropriate QoS standards. Standards based on user speed, latency and network integrity were suggested by various respondents. Three respondents believed it was appropriate to set a minimum speed metric and a level of 2 – 5 Mbits/s was suggested by one respondent. One of these respondents also suggested an average latency measure in the region of 50-80 ms and stated that it believed these levels were technically very realistic given current technologies. Another respondent suggested that QoS metrics should be measured at the network level and suggested metrics such as accessibility, retainability, congestion or integrity, while another respondent suggested that the conditions should be based on the Internet Protocol (IP) as this is the common transport protocol for internet services. One respondent suggested that

ComReg should set QoS licence conditions in consultation with the industry and review the appropriateness of these conditions at regular intervals of say every five years.

ComReg's view

The majority of the respondents supported the inclusion of QoS obligations in licences for liberalised 900 MHz spectrum. ComReg has undertaken a draft RIA to consider whether it is appropriate to impose any QoS standards. Respondents' views on more specific issues, such as the level of QoS standards and the potential for reviewing QoS over time, are considered later in this section.

15.6.2 Draft RIA on the imposition of QoS licence obligations

Step 1: Identify the policy issue and identify the objectives

The policy issue to be addressed is whether it is necessary to impose QoS obligations to ensure that users are offered a minimum service level by operators who are granted licences for liberalised 900 MHz spectrum.

ComReg's objectives which are relevant to this section insofar as they relate to the promotion of competition are to

- ensure the efficient use and effective management of spectrum
- ensure that all end users, including disabled users, derive maximum benefit in terms of choice, price and quality
- encourage efficient investment in infrastructure and promote innovation
- ensure there is no distortion or restriction of competition in markets for the provision of electronic communications services.

Step 2: Identify and describe the regulatory options

ComReg has identified the following options:

Option 1: Impose no QoS conditions

Option 2: Impose QoS conditions

Step 3 & 4: Determine the impacts on stakeholders and the impacts on competition

Option 1: Do not impose QoS obligations		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS	Provided that there is a reasonable choice of operators in the market and consumers can identify the QoS provided by each operator, then a consumer could switch to an operator offering a better QoS if the consumer is dissatisfied with the service that he or she is receiving from his or her current provider.	If QoS conditions are not imposed then a market failure could occur in particular circumstances. This could arise if consumers experience poor service but cannot identify which operator is responsible for providing this poor service (e.g. where a call is made to another network a consumer cannot determine whether it is their own network or the receiver's network which is causing the problem).In these circumstances, operators will have little incentive to offer a high QoS as they cannot isolate the quality of their own service from the quality offered by other operators. As a result, the overall QoS in the market is likely to decline and all consumers may receive a poor QoS.
IMPACT ON INDUSTRY STAKEHOLDERS	Operators would have the choice to offer their preferred level of service quality. Operators could choose to offer low levels of service quality at low prices, or higher levels of service quality at higher prices as a means of achieving a competitive advantage (provided that an operator can differentiate its superior QoS from that of its competitors). Also, operators would not face costs associated with complying with specified QoS obligations.	A relaxation in QoS from current levels could cause one operator to reduce the quality of its voice calls, for example. Other operators might then have an incentive to reduce the quality of their voice calls, as they cannot isolate their higher quality voice calls from the lower quality that is available on other networks. This overall reduction in quality may result in lower demand from consumers for voice calls, and all operators are negatively impacted.
IMPACT ON COMPETITION	Operators would compete on the basis of different levels of quality.	As QoS standards currently exist in the market, the relaxation of these standards could attract firms that want to deliver a lower quality, at a lower price. If consumers express a marked preference for such offerings, the industry is likely to gravitate to this model. In other words, with no QoS standards, operators would still compete on quality but may end up competing at a very low level of quality.

Option 2: Impose QoS obligations		
CRITERION	**ADVANTAGES**	**DISADVANTAGES**
IMPACT ON CONSUMERS	Consumers would be guaranteed a minimum QoS from each operator in the market based on specified metrics (e.g. network performance and availability, voice call quality). Customers have a form of redress to the regulator if these standards are not met. The regulator would act as a watchdog for consumers by ensuring that these QoS standards are met.	The imposition of QoS obligations would require both expenditure to achieve the mandated QoS and ongoing monitoring by licensees to ensure compliance. These costs may be passed on to consumers.
IMPACT ON INDUSTRY STAKEHOLDERS	With minimum QoS standards, licensees would be assured that no other licensee could avoid meeting these minimum standards. This would ensure that investments in QoS by licensees are not wasted.	If QoS levels are set at an inappropriate level, this could result in higher costs and less flexibility for operators. It would reduce the potential for new licensees to enter who wanted to offer low QoS at a low price.
IMPACT ON COMPETITION	If QoS standards are set at a reasonable level, there would still be headroom for licensees to invest in QoS that delivers above the minimum levels in ways that consumers can perceive. As such, licensees can compete on QoS in excess of the minimum. While QoS standards set a floor on quality levels, the competitive process above this floor would be left intact.	Increased cost of entry could perhaps reduce competition.

Step 5: Assess the impacts and choose the best option.

If competition in a market is weak, or if switching costs are very high, then operators have little incentive to offer high quality services to customers at a reasonable price. With limited options for switching, customers have less opportunities to switch provider if they are not happy with the service they are receiving. In such markets, setting minimum QoS standards ensures that customers are guaranteed at least a reasonable QoS , as the regulator can take appropriate enforcement actions where there is non-compliance.

The more competitive a market is, the lower the need for regulatory intervention to set minimum quality standards, as these will be delivered by the market alone. In a competitive market, operators compete aggressively for customers and are driven to improve the quality of their services because if they do not do so they risk losing customers to their competitors. The more competitive a market is, the higher the quality of services that operators will have to offer in order to win and keep customers. In such market cases, imposing QoS standards may be unnecessary and disproportionate as it will involve ongoing compliance costs for both the operator and the regulator.

The above comments apply to market in general, however even in competition markets there may be circumstances where minimum QoS standards may still be needed in order to prevent a potential market failure. In telecommunications markets, a potential market failure could arise as a result of an information problem whereby consumers may not be in a position to identify the quality of different operators' services and if there is a problem with the quality of the service it may not be possible for the customer to attribute the source of the problem to a particular operator. This can give incentives for operators to compete on a very low level of quality. In these circumstances we believe that it is appropriate to set minimum QoS standards to overcome this information problem.

Q.22. Do you agree with the outcome of the draft RIA that QoS standards should be imposed as a safeguard measure to overcome the potential market failure which may exist in communications markets?

15.6.3 Setting Potential QoS Obligations for liberalised 900 MHz licences

Having regard to ComReg's statutory functions and objectives and the outcome of the draft RIA, ComReg believes that there are reasonable grounds to impose QoS standards in future licences for liberalised 900 MHz spectrum, particularly to protect the interests of users. The majority of respondents also agreed with the imposition of minimum QoS obligations.

The next issue is to consider the areas where potential market failures may arise, and where QoS standards may be required. As noted above in Section 15.4.2.1, ComReg is of the preliminary view that a service neutral approach should be adopted and it is not appropriate to prescribe which services a licensee can provide using liberalised 900 MHz spectrum. Therefore any QoS standards that may be imposed must be in accordance with service and technology neutral licensing regime. QoS standards must also be measurable so that they can be properly enforced.

QoS standards exist under the current GSM and 3G licensees. ComReg has used these standards as a guide when considering the QoS standards that should be set under the licences for liberalised 900 MHz spectrum.

In the sections that follow, the issue of symmetric or asymmetric QoS standards is considered and whether or not multiple spectrum bands could be used to meet QoS standards. A number of different areas are then considered to determine whether QoS standards are necessary and if so, the level which would be appropriate.

15.6.4 Symmetric or Asymmetric QoS Obligations

There does not appear to be any reason for applying different QoS standards to different licensees as access to an existing network or not does not appear to impact the QoS obligation considerations. QoS conditions differ from coverage and roll-out conditions in this regard.

ComReg's view

ComReg is of the view that the same QoS standards should apply to each new licensee in the band as there is no objective justification for setting asymmetric QoS licence conditions.

Q.23.	**Do you agree with ComReg's proposal to apply the same QoS obligations to each new licensee in the band?**

15.6.5 Meeting QoS Obligations using the 900 MHz band or Multiple Bands

As services can be provided over multiple frequencies, and customers should be indifferent as to which frequency band a licensee uses to provide a particular service, an issue to consider is whether any QoS standards should be set which apply to the 900 MHz band in isolation, or whether the same standards should be imposed across multiple frequencies.

ComReg's view

ComReg is of the view that it is more appropriate from a consumer perspective to set QoS standards on the basis of the service offered, rather than the spectrum which is used to provide this service.

Q.24.	**Do you agree that QoS standards should be set on the basis of the service offered rather than in relation to spectrum used to provide this service?**

15.6.6 QoS Standards at a Service level

As noted above, the draft RIA indicates that there are reasonable grounds to impose minimum QoS standards in licences for liberalised 900 MHz spectrum. In the context of a service and technology neutral approach, ComReg is of the view that such QoS standards should only apply if a particular service is offered and there should be no compulsion on an operator to provide any particular service. ComReg will now consider whether it is appropriate to set QoS standards for particular services, namely voice and broadband, as these are the two most likely services to be provided using new liberalised licences.

ComReg is minded to reserve the right to set quality of service standards for new emerging technologies and services as they are introduced.

15.6.6.1 QoS Obligations for Voice Calls

The three current GSM licences (Vodafone, O2, Meteor) each contain similar QoS measures at a network level relating to voice calls[114]. There are three types of voice quality measures[115]:

- Blocked calls – this is a measure of the proportion of unsuccessful call attempts to successful calls, when a subscriber tries to make a call[116];
- Dropped calls – this is a measure of the proportion of calls which are ended before the caller/receiver ends the call[117];
- Transmission quality – this is a measure of the sound quality of the call[118].

Respondents did not express any specific views as to whether there should be minimum QoS standards in relation to voice calls, or what level such standards might be set at. The DotEcon report suggests that it might be sensible to safeguard current quality standards for voice calls, but to standardise the various different thresholds that currently pertain across GSM licences.

ComReg's view

When considering potential QoS standards on voice services, ComReg is mindful of the four factors discussed at the outset of this section (see Section 15.3). The current GSM voice standards are a good starting point for considering voice QoS standards for licences for liberalised 900 MHz spectrum.

ComReg is of the view that QoS standards for voice calls should be attached to the new licences. Imposing QoS standards for voice calls is appropriate because of the manner in which voice calls are transmitted. Voice calls can originate and terminate on different networks, and due to Mobile Number Portability a customer does not know which network he or she is calling. Therefore a consumer who experiences poor voice call quality has no way of determining whether it is their own network or the network of the receiver which is causing the problem. In such circumstances, there is the potential for a market failure to arise. Therefore ComReg is of the view that it is appropriate to set minimum QoS levels for voice calls to safeguard

[114] There are no QoS standards relating to voice calls in the 3G licences.

[115] The obligations for each of these three measures differ slightly across each of the three GSM licensees.

[116] The rate of blocked calls is measured using a 'Time consistent busy hour'. The time consistent busy hour is determined from the operator's voice traffic. It is the one-hour period during which there is the highest level of traffic. The blocked call rates are measured for the same one-hour period during each review period (e.g. 6 months). The one-hour period is determined by the operator and is subject to ComReg's approval.

[117] This measure is based on a three minute call duration.

[118] The transmission quality measure set in the existing GSM licences refers explicitly to the use of GSM standard.

consumers against this, and that these standards are set at a uniform level across all new licensees.

As to the appropriate level for voice call QoS standards, consumers expect standards that are in line with the standards under current GSM licences, and those same standards should attach to future licences for liberalised 900MHz spectrum. This would be in the interests of consumers as it would ensure a minimum QoS standard that is in line with current expectations. Additionally it would not seem to place an onerous burden on operators as they would likely have to deliver voice call services of this quality in order to meet consumer expectations. As such, a voice call QoS standard that is in line with existing GSM licences would appear to be unlikely to distort competition or result in efficient investment.

Proposed Voice Calls QoS licence condition.

If a licensee offers a mobile voice call service, it must comply with the following requirements. Licensees must measure and report compliance with these requirements to ComReg every 6 months.

	Average	Worst Case
1. Maximum Permissible Blocking Rates This refers to the maximum percentage of total call attempts which are unsuccessful during the time consistent busy hour[119].	2%	4%
2. Maximum Permissible Dropped Call Rates This refers to the maximum percentage of total originating calls which are prematurely released by the network within 3 minutes of the call being made.	2%	4%
3. Transmission quality The licensee shall ensure that the speech transmission quality is as good or better than the speech quality associated with the GSM Standard and GSM Technical Specifications of ETSI. The licensee shall ensure that appropriate echo treatment equipment is used and that it is properly configured.		

Q.25. Do you agree with the ComReg' proposed voice calls QoS licence condition and the three proposed QoS metrics for measuring the voice call service?

15.6.6.2 VoIP calls

ComReg is aware of the recent upward trend in use of VoIP ("Voice over IP"). In the forthcoming Common European Regulatory Framework, the text of the Directive amending the Framework directive as currently proposed will change the definition of "voice call provider" such that it covers all providers of voice calls

[119] "Time consistent busy hour" means the period of one-hour starting at the same time each day for which the average traffic of the network concerned is greatest over the days under consideration. The time consistent busy hour shall be determined from an analysis of traffic data obtained from the service and be subject to the approval of the Commission.

The 'Time consistent busy hour' is determined from the operator's voice traffic. It is the one-hour period during which there is the highest level of traffic. The blocked call rates are measured for the same one-hour period during each review period (i.e. 6 months). The one-hour period is determined by the operator and is subject to ComReg's approval.

which can be made to any number in a national numbering plan (as opposed to the distinction which currently exists between a PATS (Publicly Available Telephone Service) provider and a ECS provider).

Given these changes and the growing importance of VoIP services, ComReg is of the view that it may be appropriate to set minimum QoS standards that are relevant and appropriate for VoIP calls. The European Telecommunications Standards Institute (ETSI) has issued standards which can be applied to VoIP calls[120]. ComReg is interested in respondents' views on whether it is appropriate to monitor the quality of VoIP calls and include QoS standards for VoIP calls in new 900 MHz licences.

Q.26.	**Should QoS metrics be set for VoIP voice calls? If so, what QoS standards do you believe are appropriate? How would these standards be measured and monitored?**

15.6.7 QoS Obligations for Broadband Services

The current 3G licences have set various obligations in relation to the 3G licensee's minimum network speed. On the downlink, these obligations range from a minimum network speed of 384kb/s to 1.15 Mb/s, while on the uplink the obligations range from a minimum network speed of 144 kb/s to 384 kb/s. To date, all of the 3G licensees have met their minimum QoS network speed obligations and the majority of the mobile broadband offerings in the market refer to product headline speeds in the region of 3Mb/s to 7 Mb/s downlink and 384 kb/s to 1 Mb/s uplink[121].

Under the GSM directive, the restriction of the 900 MHz band to GSM technology means that this band could not be used to used to provide data services such as mobile broadband. With the liberalisation of 900 MHz, this is likely to be a key service provided by new licensees in the band.

In response to 09/14, respondents put forward a range of views as to an appropriate quality of service standard for a mobile data service. Three respondents believed it was appropriate to set a minimum speed metric and a level of 2 – 5 Mb/s was suggested by one respondent. One of these respondents also suggested an average latency measure in the region of 50-80 ms and stated that it believed these levels were technically very realistic given current technologies.

ComReg's view

Unlike the QoS standards that may attach to voice calls, as discussed above, the same risk of market failure does not appear to exist in the case of broadband

[120] For example EG 202 057-1: Speech Processing, Transmission and Quality Aspects(STQ); User related QoS parameter definitions and measurements (2008)

[121] See www.callcosts.ie

services. This is because the consumer has a contract with a particular service provider who is fully responsible for the delivery of that service and the quality of that service. Hence there are no issues per se with establishing the entity responsible for the poor service, as can be the case with voice calls between different networks. Hence one could argue that it may not be appropriate to set minimum QoS standards for broadband services for end-users.

On the other hand, specifying a minimum network speed, as per the 3G licence obligations, provides certainty that the licensee's network will be capable of providing a minimum data speed, and this can be of benefit to consumers in choosing a service provider.

Overall, ComReg seeks views on whether it is appropriate to set a mobile broadband QoS obligation in any new 900 MHz licence issued. If such an obligation is appropriate, then ComReg proposes that this obligation is set at the network level with minimum speeds of 3 Mb/s downlink and 384 kb/s uplink.

Q.27.	**Do you believe that it is appropriate to set a mobile broadband QoS obligation in any new 900 MHz licence issued? If yes, do you agree with ComReg's proposal to set this obligation at the network level with minimum speeds of 3 Mb/s downlink and 384 kb/s uplink.**

15.6.8 QoS Standards at a Network Level

The availability of a network is of fundamental importance to the provision of services to consumers. If a network is down this causes customer disruption. Currently all three GSM licences contain a licence condition related to service unavailability. Service unavailability is measured as the average number of minutes per terminal per year for which the service is not available due to a network disturbance, failure or scheduled unavailability. It is measured using weighting factors that take account of traffic load variations. For Meteor and O2, it is set at 60 minutes per annum while for Vodafone it is set at 45 minutes per six month period.

One respondent to 09/14 suggested that QoS metrics should be measured at the network level and suggested metrics such as accessibility, retainability, congestion or integrity.

ComReg's view

For new licences, ComReg is of the view that it is appropriate to set a licence condition relating to network performance to protect consumers against unreasonable levels of disruption. ComReg believes that it is appropriate to require operators to keep a log of network availability, as is the case with the existing GSM and 3G Licences, and that licensees should use this to ensure that service unavailability is less than 45 minutes per six month period. ComReg is of the view

that it is reasonable to set this standard at the tightest level of the three GSM licences (i.e. the 45 minutes per six month period) as the reliability of networks and equipment has improved over time.

Proposed Network QoS licence condition

The licensee shall maintain a log of system availability for any network using the licensed spectrum in whole or in part.

The licensee shall ensure that service unavailability is less than 45 minutes (based on the weighting factors below) per six month period. Every six months, the licensee shall submit a compliance report to ComReg showing that the specified average network availability has been achieved.

Service Unavailability, Weighting Factors
(divide duration of each network event by weighting factor)

	Monday to Friday	Saturday	Sunday
Between 07.00 and 24.00	1	2	4
Between 00.00 and 07.00	4	8	16

Q.28. Do you agree with ComReg's proposed QoS metrics for network performance and the level at which it is proposed to be set?

15.6.9 QoS Measures at a Consumer Level

The current GSM and 3G licences contain QoS standards which specify standards in relation to billing. GSM licensees are required to provide customers with monthly paper bills based on per second billing. Operators must also provide itemised bills containing the following information for each billable call: date, start time, number called, call duration, and price of the call. These obligations must be met unless agreed otherwise with individual customers. 3G licensees are required to provide customers with monthly, itemised paper bills. These obligations must be met unless agreed otherwise with individual customers. In both GSM and 3G licences there are additional requirements:

- In the interests of billing accuracy, operators must incorporate measures in their billing system to ensure that each call record is an accurate record of the actual call and that the correct accumulated call records are applied to generate each customer's bill.
- In the interests of fraud detection, operators must incorporate measures to detect cases of possible fraud including measures to identify rapidly abnormal calling patterns.

ComReg's view

ComReg believes that the existing billing conditions imposed under GSM and 3G licences strike a good balance in safeguarding the interests of consumers without imposing unnecessary costs on licensees. Any billing conditions that are imposed

under future licences for liberalised spectrum should be guided by the principles of transparency, disaggregation and clarity of any usage metrics and should require licensees to provide transparent and disaggregated bills that allow consumers to determine the costs of individual services. In cases where services are billed by usage (as opposed to at a flat rate) the usage metric must be clear and transparent to consumers. If voice calls are billed by use, billing obligations could be the same as the existing GSM and 3G licences (to provide start time, end time, duration and call cost). These billing obligations would apply to any service delivered.

Proposed Billing Obligation

Unless agreed otherwise with individual customers, the licensee shall provide a transparent, disaggregated paper bills to customers. Services which are charged based on usage should clearly indicate the usage metric. Calls must be charged on a per second basis. Data services must be charged on a per usage basis.

The licensee shall ensure that bills are accurately generated.

The licensee shall take appropriate measures to detect cases of possible fraud including measures to identify rapidly abnormal calling patterns.

Q.29. Do you agree with ComReg's proposed billing obligation?

The majority of GSM and 3G licences were granted before the 2003 Telecommunications Regulatory Framework was established, which introduced the General Authorisation. The General Authorisation is the general mechanism used to address QoS issues at a consumer level. For this reason, ComReg considers that it may be more appropriate to include provisions relating to the imposition of billing conditions in the General Authorisation, rather than in the actual licence which is granted under Regulations made by ComReg pursuant to the Act of 1926. ComReg seeks views on whether it is appropriate to continue to include the proposed billing condition in any new 900 MHz licence issued or whether it is better to address such issues as part of a General Authorisation.

Q.30. Should QoS measures at a consumer level (e.g. billing) be addressed as a licence condition in the 900 MHz licence or as part of a General Authorisation?

15.6.10 Review Process for QoS standards

One respondent to 09/14 suggested that QoS licence obligations should be subject to a review every five years. Current GSM and 3G licences do not have any review procedures.

ComReg's view

The aim of QoS conditions is to set minimum QoS standards that are relevant to the services being offered to consumers. As retail services change over time, ComReg is of the view that it may be appropriate to carry out a review at regular intervals to ensure that these QoS standards remain appropriate. The scope of such a review would be to update the relevant QoS targets to industry best practice in order that Irish consumers receive a high QoS. This review may also include the potential to set QoS conditions for new services which are not currently available, and to take account of any relevant changes to the market environment. This review could also address the appropriate QoS standards for licences commencing in 2015.

Q.31.	**Do you agree that it is reasonable for ComReg to review and possibly update the QoS standards over the lifetime of the licence, such as every 5 years, or as appropriate due to changes in the market?**

15.6.11 Reporting on compliance

An obligation to report on compliance is an obligation that identifies the reporting information and processes required for assessing a licensee's compliance with its licence conditions and commitments, and assists ComReg in achieving its objectives to ensure the efficient use and effective management of spectrum.

In the existing GSM and 3G licences, there are reporting obligations set out in relation to the specific QoS obligations and there is a general obligation on the licensee to provide information for the purposes of carrying out QoS surveys or spot checks. Additionally the conditions attached to a general authorisation for the provision of electronic communications networks and services contain a general "provision of information" condition[122].

ComReg's view

ComReg believes that it is appropriate to include a reporting on compliance obligation in any new 900 MHz licence issued, to ensure compliance and enable ComReg to monitor the continuing appropriateness of the obligations, and believes that the conditions in the existing GSM and 3G licences provide a good framework. To enable ComReg to carry out spot checks to ensure that licensees are complying with their QoS conditions and accurately reporting on their compliance, ComReg is of the view that it would be appropriate to require licensees to provide to ComReg, on request, the following:

- Maps showing Coverage as defined in the licence;
- An up to date list of the locations of the base transceiver stations;

[122] ComReg 03/81R1 - General Authorisation - November 2008

- A mechanism for identifying the base station that is handling a call at any given time;
- An adequate number of test numbers.

Q.32.	**Do you agree with ComReg's proposed reporting on compliance obligation?**

15.6.12 Penalties and Performance Guarantees

As discussed in Section 15.5.4.5 in relation to coverage obligations, to ensure that licence conditions are met it is appropriate to have a range of credible and enforceable penalties which are appropriate to address the non-compliance, and DotEcon in its report state that a performance bond guarantee of around €2-3 million may be appropriate for minor licence compliance breaches, which result in the loss of some or all of this bond

ComReg's view

In any licences for liberalised 900 MHz spectrum, ComReg believes that it would be beneficial to have a range of sanctions appropriate to the compliance breach. ComReg proposes to include a performance guarantee of €1 million against the aforementioned QoS obligations, and when considered with the proposed coverage performance guarantee the total amount proposed performacne guarantees is €3 million.

Q.33.	**Do you agree with ComReg's proposal to include a €1 million performance guarantee against the QoS obligations in any new 900 MHz licence issued?**

15.7 Proposed Miscellaneous Conditions

15.7.1 Non-Ionising Radiation

Non-ionising radiation is the part of the electromagnetic spectrum below 3000 million MHz (3×10^{15} Hz). Radio waves, infrared radiation and visible light are examples of non-ionising radiation[123]. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an independent, scientific organisation which was established to provide guidance and recommendations on protection

[123] Non-ionising radiation includes all radiations and fields of the electromagnetic spectrum that do not normally have sufficient energy to produce ionisation in matter and is characterised by energy per photon of less than about 12 eV and wavelengths greater than 100 nm. Electromagnetic waves at frequencies above 3000 million MHz are known as ionising radiation and this includes X-rays and Gamma rays as well as some Ultraviolet radiation.

from non-ionising radiation exposure[124]. It has issued guidelines on measures which should be taken by mobile operators to protect the general public against the effects of non-ionising radiation and these measures have been set out as a condition in all the Wireless Telegraphy Regulations issued to date. The text of this Non-Ionising Radiation condition is set out below.

> *"The Licensee shall ensure that non-ionising radiation emissions from the Apparatus operated by the Licensee are within the limits specified by the guidelines published by ICNIRP, any radiation emission standards adopted and published by ICNIRP, or its successors, from time to time, any radiation emission standards of the European Committee for Electrotechnical Standardization and any radiation emission standards specified by national and European Community law;*
>
> *The Licensee shall ensure that the Apparatus operated by the Licensee is not installed or operated at a location in a manner which causes the aggregate non-ionising radiation emissions at that location to exceed the limits specified by any guidelines published by ICNIRP and that it complies with any radiation emission standards adopted and published by ICNIRP, or its successors, any radiation emission standards of the European Committee for Electrotechnical Standardization and any radiation emission standards specified by national and European Community law;"*

ComReg's view

ComReg proposes to include a similar Non-Ionising Radiation condition in all new licences issued in the 900 MHz band and require licensees to meet the guidelines issued by ICNIRP, which may be updated from time to time.

Q.34.	**Do you agree with ComReg's proposed non-ionising radiation licence condition?**

15.7.2 International Roaming Capability

International roaming refers to the ability of a mobile user to use their mobile device both at home and abroad. The current GSM and 3G licences include the following licence condition in relation to international roaming:

> ***International Roaming:***
> *1. The Licensee shall establish and maintain as part of its Mobile Service an international roaming capability for its customers that is as wide and comprehensive as is practicable.*
>
> *2. Where requested to do so, the Licensee shall provide to members of the public, maps from other 2G and 3G operators with whom it has international Roaming Agreements showing the Coverage provided by them.*

[124] The International Commission on Non-Ionizing Radiation Protection (ICNIRP) was established in 1992. It operates in co-operation with the Environmental Health Division of the World Health Organisation and the United Nations Environment Programme.

ComReg notes that the Amending Directive and EC Decision do not explicitly require licensees to have the capability of providing pan-European services.

ComReg's view

ComReg proposes to include a similar International Roaming Capability condition in all new licences issued in the 900 MHz band.

Q.35.	**Do you agree with ComReg's proposed international roaming capability licence condition?**

15.7.3 Access to the Emergency Services

The Universal Service Directive requires that end-users should be able to call and access the emergency services using any telephone service capable of originating voice calls through a number or numbers in national telephone numbering plans[125.] This obligation is included in the current GSM and 3G licences and requires mobile operators to ensure that people with a mobile phone can connect to the emergency services networks when necessary. The important societal benefits of such an obligation are clear. It ensures that persons in emergency situations can get in touch with the emergency services from their mobile phones without incurring any cost. The details of the current provision in the GSM and 3G licences include the following[126]:

- The licensee shall provide ready access for customers through the Licensed Mobile Services to the emergency services. The "emergency service" means the Garda Síochána, the fire brigade services, the ambulance services, the boat and coastal rescue services (including the rescue services provided by the Air Corps) or the mountain and cave rescue services.
- ComReg may give directions in writing to the licensee in relation to the handling of calls to and from customers relating to an emergency service ("emergency calls"), and the licensee shall comply with any such directions.
- Emergency access codes 112 and 999 shall be open to all terminal equipment equipped with a valid SIM Card (or equivalent), where technically necessary, and any other codes subsequently designated for use as emergency access codes, exclusively for calls to the emergency services
- The licensee shall ensure that an emergency call is routed at the expense of the licensee, to a collection centre for emergency calls. The licensee shall

[125] The Universal Service Directive (2002/22/EC)
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:108:0051:0077:EN:PDF

[126] The Universal Service and Users' Rights Regulations (S.I. No. 308 of 2003)
http://www.irishstatutebook.ie/2003/en/si/0308.html

provide not less than two routes with physical diversity between each mobile switching centre and a collection centre as described.

- The licensee shall provide this service free of charge.
- When an emergency call is made to an emergency service from terminal equipment of a customer, the licensee shall, where technically possible, transmit the customer's number to a collection centre for emergency calls in the form of a calling line identification message.

The Universal Service Directive is currently undergoing amendment[127]. The new draft still requires that access to the emergency services be provided to end-users but it has also been proposed to strengthen the obligations on undertakings in relation to the provision of information on caller location[128]. It is generally recognised that accurate caller location is an important factor in helping the emergency services respond quickly and effectively to emergency situations and ultimately save lives and/or reduce the severity of injuries[129]. The current proposal is that Member States would be obliged to ensure that mobile caller location is made available to the emergency services free of charge and as soon as the call reaches the emergency services. The proposal also seeks to set down the criteria for the accuracy and reliability of the location information provided but does not specify the precise technical implementing measures.

ComReg's view

ComReg proposes that the current Access to Emergency Service provisions in the existing GSM and 3G licences be maintained in any new 900 MHz licence issued. Additionally, ComReg proposes to update these provision in line with the new Universal Services Directive.

Specifically in relation to the provision of mobile caller location, ComReg proposes to include the following condition in an Access to Emergency Service licence condition.

"The Licensee shall make caller location information available free of charge to the emergency services as soon as the call reaches that authority handling the emergency call."

---

[127] While still in draft ComReg does not expect significant change before it is adopted into Irish Law in 2011.

[128] Article 26 (5) states "Member States shall ensure that undertakings concerned make caller location information available free of charge to the authority handling emergency calls as soon as the call reaches that authority. This shall apply to all calls to the single European emergency call number "112". Member States may extend this obligation to cover calls to national emergency numbers. Competent regulatory authorities shall lay down criteria for the accuracy and reliability of the location information provided."
Source:http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0360+0+DOC+XML+V0//EN

[129] The need for accurate mobile caller location has also been noted by other European initiatives, such as the EC eCall initiative. COM2009/434 – 'eCall: Time for Deployment' - 28 August 2009 - http://www.parliament.bg/pub/ECD/COM_2009_434_EN_ACTE_f.doc

The proposed new Universal Services Directive does not specify the accuracy levels associated with a caller's locations, but states that "*Competent regulatory authorities shall lay down criteria for the accuracy and reliability of the location information provided*." ComReg understands that there are various methods of providing mobile caller location information and the degree of accuracy and costs of implementation will vary with the method employed. ComReg proposes to include the following condition in its Access to Emergency Services licence condition.

> *"ComReg may give directions in writing to the Licensee in relation to the required criteria for the accuracy and reliability of the location information to be provided to the Emergency Services and the Licensee shall comply with any such directions."*

In relation to access to the emergency services by people with disabilities, the proposed new Universal Services Directive states that "*Member States should take specific measures to ensure that emergency services, including "112", are equally accessible to disabled end-users, in particular deaf, hearing-impaired, speech-impaired and deaf-blind users.*" The Department of Communications Energy and National Resources is currently consulting[130] on the provision of services for the disabled community and the use of SMS access for 112 calls is under consideration. It is worth considering therefore whether an Access to the Emergency Services licence condition should include SMS access to the emergency services as this could assist more vulnerable sections of the community to access the emergency services. If SMS was included in the licence condition, the issue of providing information on the location of the SMS sender to the emergency services would also arise. As this consultation is still ongoing, ComReg proposes to take no action at this particular stage but await the outcome of the Department's consultation. Should SMS be introduced at a later stage, ComReg reserves the right to specify the criteria for location information accuracy and reliability as appropriate.

Proposed Licence Condition

The current Access to Emergency Service provisions in the existing GSM and 3G licences be maintained in any new 900 MHz licence issued.

The licensee shall make caller location information available free of charge to the emergency services as soon as the call reaches that authority handling the emergency call.

ComReg may give directions in writing to the licensee in relation to the required criteria for the accuracy and reliability of the location information to be provided to the Emergency Services

[130] Consultation on services for the disabled community
http://www.dcenr.gov.ie/Communications/Business+and+Technology/ECAS+Consultation+on+handling+of+calls+from+persons+with+disabilities.htm

Q.36. Do you agree with ComReg's proposed licence conditions on access to emergency services and calling location information?

15.8 Mobile Virtual Network Operator (Question 1 to 4 of 09/14)

In the Response to Consultation further views were sought on ComReg's proposal to require future holders of liberalised 900 MHz spectrum to provide hosting services to a Mobile Virtual Network Operator[131] (MVNO). In particular, more detailed views were sought on MVNO and the competitive process, MVNO licence commitments, MVNO wholesale pricing, and any other technical issues relating to MVNO commitments. The questions that were asked are set out below.

Questions Posed in Consultation 09/14

Q.1. of 09/14: MVNO and the competitive process:

a. What would be the impact of MVNOs on competition and investment?

b. What in your opinion would be the likely benefits and costs of ComReg inviting MVNO commitments as part of a future 900 MHz spectrum licence competition?
In support of your response please refer to current and likely future market conditions and developments.

Q.2. of 09/14: MVNO licence commitments:

a. What should be the minimum services encompassed by MVNO licence commitments?

b. Should any services be excluded or should this be left solely to normal commercial agreement?

c. How might MVNO licence commitments be enforced? What criteria, processes and timelines might apply?

[131] A licensed mobile operator with no spectrum assignment and with or without network infrastructure.

Q.3. of 09/14: MVNO Wholesale Pricing:

a. Should wholesale pricing considerations form part of any discussion on MVNO commitments?

b. What factors should form the basis of any wholesale pricing structure in the event that MVNO licence commitments are included in any future 900 MHz spectrum licences? Please support your response with the reasoning for considering any such factors.

Q.4. of 09/14: MVNO Technical Issues:

a. Are there any technical or practical constraints to the inclusion of MVNO commitments within future 900 MHz licences in a liberalised setting? Please provide reasons for your view.

15.8.1 General Views of Respondents on MVNO Commitments

The views of most respondents were contained in the body of their respective responses and not as a direct response to the questions posed. Their general responses are summarised below with further detail provided in the section dealing with the response to the consultation questions.

All ten respondents replied to this section. Five respondents were opposed to any MVNO commitments, four respondents agreed in principle with the proposals and one had no particular opinion.

The five respondents who were not in favour of MVNO commitments in the licence were all consistent in their arguments as to why MVNO commitments should not be included. All of the MNOs were included in this group of respondents and they all referred to the growth in competition in the Irish Mobile market. This has included the move from a single MVNO (Tesco), to three MVNOs (Tesco, Eircom and An Post). The respondents argued that this fact proves that the market is now sufficiently competitive and that mandatory MVNO conditions are no longer a necessary orproportionate regulatory tool.

These respondents also argued that ComReg could only impose MVNO obligations on operators after establishing Significant Market Power under the Access Regulations[132] and three of the five respondents stated that under the legislation any condition imposed had to be objectively justified, proportionate, non-discriminatory and transparent.

[132] SI No.305 of 2003 European Communities (Electronic Communications Networks and Services) (Access) Regulations, 2003.

One operator, while rejecting the proposal to include MVNO obligations in future licences, argued that there was sufficient competition in the Irish market to enable mass porting of numbers under Ireland's efficient Mobile Number Portability (MNP) System. The operator argued that this would cope with a failure by a current major player to retain sufficient 900 MHz spectrum. However, ComReg notes that the respondent took no account of the remaining operators' capacity to support the newly ported traffic.

In terms of ComReg's proposal to require future holders of liberalised 900 MHz spectrum to provide hosting services to MVNO, an MVNO commitment could come about from the competitive process: i.e. offered in return for some consideration by ComReg, whether, as suggested by one respondent who was in favour of MVNO conditions, by bidding credits, or through another mechanism, such as a possible licence fee discount.

Two respondents responded directly on ComReg's use of the term 'commitment'. One such respondent focussed on the distinction between the meaning of the terms 'condition' and 'commitment' and argued that *"a commitment is a solution volunteered by an undertaking to resolve a regulatory impasse; a condition is a solution imposed by a regulator."* This respondent further stated that ComReg's proposal was an attempt to "dress up" a condition as a commitment. This respondent referred, by way of example, to the European Merger Regulations which provides for undertakings to provide commitments during negotiations with the European Commission to ameliorate the effects of a merger. The Commission may then require adherence to these commitments as a condition of its merger clearance.

The other respondent who expressed concern about use of the word 'commitment' cited Condition 6 of Schedule B of the Authorisation Regulations 2003 and argued that Condition 6 is intended to apply to a situation where a party makes a commitment in order to improve its chances of success in a competitive or comparative procedure. In support of its contention, the respondent cited a passage from *Nihoul and Rodford*[133] concerning Condition 6, and which States: "in these circumstances, undertakings are ready to accept additional obligations in the hope of being selected in preference to the other candidates". This respondent also argued that a commitment could not be classified as "voluntary" if it forms part of a pre-qualification process.

Three out of the four MNOs held the view that the market was already competitive and emphasisedthat there was no objective, transparent, proportionate or non-discriminatory reasons to impose the MVNO obligations. They referred to the fact that MVNO access has been provided by the three existing MNOs despite the fact that this is not an explicit conditions of their GSM licences, while the single MNO that had this condition set out in its licence has failed to successfully conclude any

[133] EU Electronic Communications Law: Competition and Regulation in the European Telecommunications Market - Paul Nihoul and Peter Rodford

MVNO agreements to date. They argued that this proved that the condition itself was unenforceable and should not be included in the licence. One respondent stated that it failed to see the relevance or the appropriateness of ComReg's questions regarding MVNO access. This respondent then argued that including such a condition would cause confusion and make the spectrum allocation process less transparent.

Another respondent expressed its concern that to impose mandatory MVNO access, either through licence conditions or on foot of voluntary offerings by the operator, would lead to significant risk of legal challenge and would thus delay the whole process of spectrum allocation.

Three of the four respondents who favoured MVNO access were from the OAO community. One such respondent stated it was in favour of the option with little further qualification. Another pointed to the difficulty an operator would have in obtaining capital funding without MVNO access guaranteed in the 900 MHz band. Another preferred a light-handed approach to regulating MVNO access, based on commercially negotiated rates, and envisaged that ComReg would only set minimum commercial requirements in the licence. The final of these four respondents stated that customer care, billing, the provision of value added services, and transportation, should be removed from the retail price for interconnection. Furthermore they proposed a 'cost plus' pricing model should be enforced for operators having a 50% or greater market share. This respondent and two of the other respondents who favoured MVNO access, were of the opinion that mandatory wholesale access should be part of the licence.

15.8.2 Question 1: MVNO and the Competitive Process

Only two respondents responded directly to the consultation questions. One of those two respondents argued that any benefits which may arise from MVNO licence commitments would be marginal at best, given that there are already MVNOs active in the market and there is no evidence of unsatisfied demand for MVNO agreements.

In terms of the costs of imposing MVNO licence conditions, the two respondents made the following points:

- It raises the possibility of a potential legal challenge which might bring delay.
- It may complicate the auction format by introducing elements of a beauty contest/comparative selection rather than holding a pure auction. MVNO commitments would have to be assigned some weighting. This is likely to cause confusion and uncertainty.
- It creates a risk of an inefficient outcome to the auction as the spectrum may not be awarded to the party that values it the most.
- There is a risk that imposing such an obligation may lead to obligations to grant MVNO access on sub-commercial terms.

15.8.3 Question 2: MVNO Licence Commitments

Only one respondent made direct comments on this question. It state that it believed that it would be completely disproportionate for ComReg to impose *ex ante* regulatory obligations on operators prior to a determination of SMP . The respondent also expressed serious concerns that any attempt to include MVNO conditions in the licence would delay liberalisation as it would be subject to legal challenge.

15.8.4 ComReg's View

The responses received highlight that the issue of MVNO commitments is complex. ComReg has a key role to play in ensuring that the retail mobile market (both voice and data services) is effectively competitive. In this regard, spectrum policy is a very important tool to ensure that effective competition will develop as spectrum policy sets the initial conditions of the competitive process (the number of entrants, their spectrum assignments and the timing of their entry relative to each other, the maturity of the market at time of entry etc.).

Having consulted extensively on the issue of whether or not to invite commitments to provide MVNO access as part of a future 900 MHz spectrum licence competition, noting the lack of a strong consensus favouring MVNO commitments and that no respondent stated that it would volunteer a MVNO commitment, ComReg is not minded to include an MVNO commitment in the forthcoming competition and its reasons for this position include the following:

i) In Document 08/57, ComReg identified that the likely welfare effects of increasing the number of independent competitors in the retail mobile market were substantial. This analysis formed the justification for imposing a spectrum cap in the 900 MHz band. The spectrum cap is therefore a direct tool with which ComReg can ensure that the initial conditions of the competitive process are optimised when liberalised spectrum is made available (in addition to ensuring efficient use of spectrum by preventing spectrum hoarding, etc.);
ii) The spectrum cap envisaged in the 900 MHz band should ensure that a minimum of four operators will have access to liberalised 900 MHz spectrum;
iii) Successful bidders for the valuable 900 MHz liberalised spectrum will have paid a market price for this spectrum and will therefore have incentives to maximise the return on their investments.

Furthermore, there would be uncertainty regarding the nature and operation of MVNO commitments in a service- and technology-neutral licensing environment.

Therefore, in light of the above conclusions, ComReg will continue to monitor developments in the mobile market with respect to provision of access by MNOs to prospective MVNOs.

15.9 Spectrum Realignment Period (Question 9 of 09/14)

In considering the two options proposed ComReg sought views on the duration of any time period to be allowed for spectrum realignment in the 900 MHz band. ComReg posed the following question:

Q.9. of 09/14: In the above Options, do you agree with ComReg's proposal to limit the time period for re-alignment of existing networks to other spectrum assignments to a maximum period of 6 months?

15.9.1 Views of Respondents

Eight responses were received to this question. Three respondents agreed with ComReg's proposal of a maximum six month period commenting on the reasonableness and adequacy of this approach. Although the value of a realignment period was generally recognised, there was some divergence in views with regard to its duration and execution. Views expressed included:

- Every operator's network differs significantly in terms of architecture, design and modernity.
- It is premature at this point to specify what the time period should be given the assignment is not yet known and also the likely necessity for sequencing with regard to realignment.
- Realignment should be extended until the switch off of analogue television services so as to have a unified realignment plan for both 900 MHz and any Digital Dividend spectrum that might become available.
- A twelve month realignment period would likely be necessary.

Only one respondent opposed the idea of a realignment period submitting that it is not appropriate in the current circumstances to mandate and limit the re-alignment process through a time period set by the regulator. This respondent also submitted that any realignment period, if implemented, would need to be reflected in any access fees applied.

15.9.2 ComReg's View

ComReg welcomes the views of many respondents that a realignment period will be necessary. Given ComReg's revised proposal to hold the 900 MHz auction in early 2010 with the first assignments being available in 2011 this should mitigate this issue to some degree as it will provide the operators with a period of time between the outcome of the 900 MHz competition and the start date of the 900 MHz licences in which to engage in planning and potentially installing equipment. Under these circumstances it seems that the proposed period of six months may be adequate, notwithstanding the useful points made in response to this issue. Accordingly, ComReg will revisit the proposed realignment period following the spectrum auction and assignment in 2010.

16 Submitting Comments

All comments are welcome; however it would make the task of analysing responses easier if comments were referenced to the relevant question numbers from this document.

Please set out your reasoning and supporting information for any views expressed.

The consultation period will run until 5pm on 12 February 2010 during which time ComReg welcomes written comments on any of the issues raised in this paper.

Having analysed and considered the comments received, ComReg will review the subject matter and publish a report on the consultation which will, *inter alia* summarise the responses to the consultation.

In order to promote further openness and transparency ComReg will publish all respondents' submissions to this consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information[134]. We would request that electronic submissions be submitted in an unprotected format so that they can be appended into the ComReg submissions document for publishing electronically.

Please note
ComReg may also conduct further consultations where it considers it appropriate and/or necessary to do so.

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 consultations are requested to clearly identify confidential material and place confidential material in a separate annex to their response. In anticipation of correspondence on matters relating to the 900 MHz and 1800 MHz bands, ComReg hereby gives notice that it will publish all material correspondence received in this regard.

Such information will be treated subject to the provisions of ComReg's guidelines on the treatment of confidential information.

[134] ComReg 05/24 Response to Consultation - Guidelines on the treatment of confidential information - March 2005

17 Annexes

Annex A: Glossary

Table 1 – Governmental Bodies, Regulatory and Standardisation Organisations

CEPT	European Conference of Postal and Telecommunications Administrations
CoCom	Communications Committee of the European Commission
ComReg	Commission for Communications Regulation
DCENR	Department of Communications, Energy and Natural Resources
EC	European Commission
ECC	Electronic Communications Committee of CEPT
ETSI	European Telecommunications Standards Institute
EU	European Union
ITU	International Telecommunication Union
NRA	National Regulatory Authority
RSC	The Radio Spectrum Committee of the European Commission

Table 2 – Legislation & Regulations

2002 Act	The Communications Regulation Act 2002 (No. 20 of 2002)
Access Regulations	European Communities (Electronic Communications Network & Services) (Access) Regulations 2003. SI. 305 of 2003
Act of 1926	The Wireless Telegraphy Act 1926 (No. 45 of 1926) as amended from time to time
Authorisation Regulations	European Communities (Electronic Communications Network & Services) (Authorisation) Regulations 2003. SI. 306 of 2003
Framework Regulations	European Communities (Electronic Communications Network & Services) (Framework) Regulations 2003. SI. 307 of 2003
The EC Decision	The EC's Decision 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* (2009/766/EC).
The Minister	Minister for Communications, Energy and Natural Resources
The Amending Directive	The Directive (2009/114/EC) amending Council Directive 87/372/EEC on the frequency

	bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community.
WAPECS Recommendation	Draft Commission Recommendation on the non-technical conditions attached to the rights of use for radio frequencies under the regulatory framework for electronic communications in the context of the Wireless Access Policy for Electronic Communications (WAPECS)

Table 3 – Technical Terms

2G	Second generation mobile services
2.5G	2G systems incorporating packet switched services
3G	Third Generation Mobile System
4G	Fouth Generation Mobile System
ARPU	Average Revenue Per User
Beauty Competition or Beauty Contest	A licence award method involving comparative evaluation of applications
Digital Dividend	Spectrum expected to be released following the cessation of analogue terrestrial television broadcasting services
ECJ	European Court of Justice
ECN	Electronic Communications Network
ECS	Electronic Communications Service
FWALA	Fixed Wireless Access Local Area Network
FWPMA	Fixed Wireless Point to Multi-Point Access
GDP	Gross Domestic Product
Guard-band	An unused spectrum bandwidth separating channels to prevent interference
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
HSDPA	High Speed Downlink Packet Access
IMT	International Mobile Telecommunications system
LTE	Long Term Evolution of 3G
MMDS	Multipoint Microwave Distribution Service
MNO	Mobile Network Operator
MNP	Mobile Number Portability
MoU	Memorandum of Understanding
MVNO	Mobile Virtual Network Operator (a licensed mobile operator with no spectrum assignment and with or without network infrastructure)
ODTR	Office of the Director of Telecommunications

	Regulation
Porting	Number Portability is the process by which a consumer can transfer from one service provider to another service provider while maintaining their existing telephone number
RIA	Regulatory Impact Assessment
Service Neutrality	An approach to granting of licences whereby any electronic communications service (ECS) may be provided in any frequency band over any type of electronic communications network
SMP	Significant Market Power
Technology Neutrality	An approach to granting of licences without specifying the technology to be deployed. However, certain technological requirements may be imposed to ensure compatibility with other services in the same or adjacent frequency bands
UMTS	Universal Mobile Telecommunications System
WAPECS	Wireless Access Policy for Electronic Communications Services
WiMAX	Worldwide Interoperability for Microwave Access
900 MHz Band	880 – 915 MHz paired with 925 – 960 MHz
1800 MHz Band	1710 – 1785 MHz paired with 1805 – 1880 MHz
2100 MHz Bands	1920 – 1980 MHz paired with 2110 – 2170 MHz, 1900 – 1920 MHz

Annex B: Consultation Questions

In responding to these consultation questions, please set out your reasoning and supporting information for any views expressed.

Q.1. A.	**Do you agree that ComReg should take all reasonable steps in selecting an auction format so as to ensure a competitive outcome?**
Q.1.B.	**Do you agree that a sealed bid format is the most appropriate approach in this case?**
Q.2.	**Do you agree that a "rebate" in respect of the remaining term of a licence should be provided for in ComReg's auction design?**
Q.3.	**What factors should ComReg consider in calculating any such rebate?**
Q.4.	**Do you have any comments on the setting of minimum prices or the benchmarking process employed by DotEcon and proposed to be adopted by ComReg in arriving at a minimum price?**
Q.5.	**Do you have any comments on the structure of reserve prices and spectrum usage fees?**
Q.6.	**Do you have any views on ComReg's proposed deferred payment scheme and the indexation that will apply?**
Q.7.	**Are there any other approaches ComReg should consider to mitigate any potential for auction disruption arising from the current financial and economic climate?**
Q.8.	**i) Do you agree that Meteor's continuing presence (within its current assignment of 892.7 – 899.9 MHz paired with 937.7 - 944.9 MHz) has the potential, depending on the auction outcome, to have a detrimental impact on future liberalised use of Block E or any other block in the 900 MHz band?** **ii) Do you agree with ComReg's proposal that, if the circumstances justify it, Meteor's assignment should be adjusted post-auction?** **iii) Are there any other issues which should be considered?**

Q.9.	**i) In the event that Meteor's existing frequency assignment must be adjusted post auction, please provide an estimate of the costs which might reasonably be incurred by Meteor in doing so?** **ii) Please identify any proposal as to 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.**
Q.10.	**Do you agree with ComReg's technology neutrality proposal which does not mandate the deployment of any particular technology?**
Q.11.	**Do you agree with ComReg's service neutrality proposal which does not mandate the provision of any particular service or services?**
Q.12.	**Do you agree that it is appropriate that coverage and roll-out licence conditions should be included in future licences for liberalised 900 MHz spectrum?**
Q.13.	**Do you agree with ComReg's proposal to define a distinct field strength level for each type of technology deployed in the liberalised 900 MHz band?**
Q.14.	**In relation to each category of future new 900 MHz licensee - (1) existing 900 MHz mobile network operators, (2) existing non-900 MHz mobile network operators, and (3) new entrants - should there be symmetric or asymmetric coverage and roll-out conditions?**
Q.15.	**Do you agree with ComReg's proposal to allow multiple frequency bands to count towards a 900 MHz band coverage obligation?**

Q.16.	**Apart from the 1800 MHz and 2100 MHz bands do you believe that there are other frequency bands (e.g. Digital Dividend, 2300 MHz, 2600 MHz, etc.) that can deliver seamless services in conjunction with the 900 MHz band and could be added over the lifetime of the licence to the list of multiple frequency bands?**
Q.17.	**Provided that asymmetric coverage obligations are set in the 900 MHz competition, do you agree with ComReg's proposal that the existing 900 MHz mobile network operators should meet a minimum coverage level of 90% geographic coverage within 3 years of the licence commencement date?**
Q.18.	**Provided that asymmetric coverage obligations are set in the 900 MHz competition and the aggregation of coverage across multiple frequency bands is allowed, do you agree with ComReg's proposal that the existing mobile (non-900 MHz) network operators should meet a minimum coverage level of 90% geographic coverage within 3 years of the licence commencement date?**
Q.19.	**Do you agree with ComReg's proposal that a new entrant should meet a minimum coverage level of 30% geographic coverage within 4 years of the licence commencement date, 70% geographic coverage within 7 years of the licence commencement date, and 90% geographic coverage within 10 years of the licence commencement date?**
Q.20.	**Do you believe that coverage via national roaming agreements should be allowed to count towards a 900 MHz coverage obligation and if so, to what extent?**
Q.21.	**Do you agree with ComReg's proposal to include a €2 million performance guarantee against the coverage and roll-out obligations in any new 900 MHz licence issued?**

Q.22.	**Do you agree with the outcome of the draft RIA that QoS standards should be imposed as a safeguard measure to overcome the potential market failure which may exist in communications markets?**
Q.23.	**Do you agree with ComReg's proposal to apply the same QoS obligations to each new licensee in the band?**
Q.24.	**Do you agree that QoS standards should be set on the basis of the service offered rather than in relation to spectrum used to provide this service?**
Q.25.	**Do you agree with the ComReg' proposed voice calls QoS licence condition and the three proposed QoS metrics for measuring the voice call service?**
Q.26.	**Should QoS metrics be set for VoIP voice calls? If so, what QoS standards do you believe are appropriate? How would these standards be measured and monitored?**
Q.27.	**Do you believe that it is appropriate to set a mobile broadband QoS obligation in any new 900 MHz licence issued? If yes, do you agree with ComReg's proposal to set this obligation at the network level with minimum speeds of 3 Mb/s downlink and 384 kb/s uplink.**
Q.28.	**Do you agree with ComReg's proposed QoS metrics for network performance and the level at which it is proposed to be set?**
Q.29.	**Do you agree with ComReg's proposed billing obligation?**
Q.30.	**Should QoS measures at a consumer level (e.g. billing) be addressed as a licence condition in the 900 MHz licence or as part of a General Authorisation?**
Q.31.	**Do you agree that it is reasonable for ComReg to review and possibly update the QoS standards over the lifetime of the licence, such as every 5 years, or as appropriate due to changes in the market?**

Q.32.	**Do you agree with ComReg's proposed reporting on compliance obligation?**
Q. 33.	**Do you agree with ComReg's proposal to include a €1 million performance guarantee against the QoS obligations in any new 900 MHz licence issued?**
Q.34.	**Do you agree with ComReg's proposed non-ionising radiation licence condition?**
Q.35.	**Do you agree with ComReg's proposed international roaming capability licence condition?**
Q.36.	**Do you agree with ComReg's proposed licence conditions on access to emergency services and calling location information?**

Annex C: Draft Licence Schedule

This draft schedule is provided for illustrative purposes and should be read in conjunction with Section 15 of this document.

SCHEDULE X

Part 1 Licence Commencement Date

[Enter the DATE]

Part 2 General

The Licensed Frequency Band

This licence frequency band is [enter the frequency details of the 2 x 5 MHz block or blocks] (to be known as the "Licensed 900 MHz Block")

The Licensed Terrestrial Systems and Services

This licence allows the licensee to deploy terrestrial systems capable of providing electronic communications services using the GSM and UMTS systems, as well as other terrestrial systems determined to be capable of providing electronic communications services that are in compliance with the technical implementing measures for the 900 MHz band adopted pursuant to Decision No 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community (Radio Spectrum Decision) (*); (*) OJ L 108, 24.4.2002, p. 1.

1. In the Licensed 900 MHz Block in accordance with the Wireless Telegraphy Acts, 1926 – 1988, as amended; and

2. And conforming to the standards referred to in parts 3 – 8 of this schedule.

"GSM system" shall mean an electronic communications network that complies with the GSM standards, as published by ETSI, in particular EN 301 502 and EN 301 511;

"UMTS system" shall mean an electronic communications network that complies with the UMTS standards as published by ETSI, in particular EN 301 908-1, EN 301 908-2, EN 301 908-3 and EN 301 908-11

Part 3 Access to the Emergency Services

General

The Licensee shall provide ready access for customers through the Mobile Service to the emergency services.

Calls to an Emergency Service

In this part an "emergency services" means the Garda Síochána, the fire brigade services, the ambulance services, the boat and coastal rescue services, (including the rescue services provided by the Air Corps) or the mountain and cave rescue services.

Directions by ComReg

ComReg may give directions in writing to the Licensee in relation to the handling of calls to and from customers relating to an emergency service ("emergency calls"), and the Licensee shall comply with any such directions.

Acceptance of Emergency Calls

Emergency access codes 112 and 999 shall be open to all terminal equipment equipped with a valid SIM Card (or equivalent), where technically necessary, and any other codes subsequently designated for use as emergency access codes, exclusively for calls to the emergency services

Routing of Emergency Calls

The Licensee shall ensure that an emergency call is routed at the expense of the Licensee, to a collection centre for emergency calls. The Licensee shall provide not less than two routes with physical diversity between each mobile switching centre and a collection centre as described.

Emergency Calls Free of Charge

(a) The Licensee shall not impose a charge on the customer in respect of an emergency call.

(b) The Licensee shall not list on a customer's itemised bill any emergency call.

Identification of Emergency Calls

When an emergency call is made to an emergency service from terminal equipment of a customer, the Licensee shall, where technically possible, transmit the customer's number to a collection centre for emergency calls in the form of a calling line identification message.

Provision of Mobile Caller Location

(a) The licensee shall make caller location information available free of charge to the emergency services as soon as the call reaches that authority handling the emergency call.

(b) ComReg may give directions in writing to the Licensee in relation to the required criteria for the accuracy and reliability of the location information to be provided to the Emergency Services and the Licensee shall comply with any such directions.

Maps and Data

For the purposes of carrying out quality of service and coverage surveys, the Licensee shall provide, on request, to ComReg the following:

(a) Maps showing Coverage as defined in part 5 of this schedule;
(b) An up to date list of the locations of the base transceiver stations;
(c) A mechanism for identifying the base station that is handling a call at any given time;
(d) An adequate number of test numbers.

Service Unavailability

"Service unavailability" means the average number of minutes per terminal per six month period for which the service is not available due to a network disturbance, failure or scheduled unavailability.

2.1 Measurement Guidelines

The calculation of service unavailability is subject to the following weighting factors that take account of traffic load variations:

Service Unavailability, Weighting Factors (divide duration of each network event by weighting factor)			
	Monday to Friday	Saturday	Sunday
For periods between 07.00 and 24.00	1	2	4
For periods between 00.00 and 07.00	4	8	16

2.2 Mandatory Service Standard

The Licensee shall ensure that service unavailability is less than 45 minutes per six month period.

2.3 Network Log

The Licensee shall keep a log (the “network log") for the purposes of recording and tracking all periods of system unavailability. The Licensee shall maintain this network log in a manner that will demonstrate to the satisfaction of ComReg that such a network log is

an adequate means of assessing whether the Licensee is complying with its system availability obligations under this licence.

The network log, or as may be appropriate part thereof, shall be made available on request to ComReg.

The Licensee shall calculate the service unavailability for the Mobile Services for any period specified by ComReg from the information recorded in the network log, and shall upon request and within such time as may be specified by ComReg, provide ComReg with the results of the calculation.

2.4 Reporting of Compliance

The Licensee shall measure and submit a six monthly compliance report to ComReg on service availability every six months.

Minimum Voice Call Service Standard

Where the Licensee provides a voice call service on its licensed terrestrial system in the 900 MHz band, then the Licensee shall comply with the following:

3.1 Probability of Blocking

"Blocking rate" means the percentage of total call attempts made for the traffic case concerned, during the time consistent busy hour and within coverage, which are unsuccessful.

"Time consistent busy hour" means the period of one-hour starting at the same time each day for which the average traffic of the network concerned is greatest over the days under consideration. The time consistent busy hour shall be determined from an analysis of traffic data obtained from the service and be subject to the approval of ComReg.

The Licensee shall ensure that the blocking rate shall not exceed the maximum permissible blocking rate percentages as specified in the following Table for each six (6) month period.

	Average	**Worst Case**
Maximum Permissible Blocking Rate	2%	4%

3.2 Probability of Dropping

"Dropped call rate" means the percentage of total established calls during any measurement period which are prematurely released by the network within three minutes.

The Licensee shall ensure that the dropped call rate shall not exceed the maximum permissible dropped call rate percentages as specified in specified in the following Table for each six (6) month period.

	Average	**Worst Case**
Maximum Permissible Dropped Call Rate	2%	4%

3.3 Transmission Quality

The Licensee shall ensure that the speech transmission quality is as good as or better than the speech quality associated with the GSM standard and GSM technical specifications of ETSI.

The Licensee shall ensure that appropriate echo treatment equipment is used and that it is appropriately configured.

3.4 Reporting of Compliance

The Licensee shall measure and submit 6 monthly compliance reports on the minimum voice call standard to ComReg every 6 months.

Minimum Mobile Broadband Service Standard

[If it is appropriate to include a mobile broadband QoS service standard, then]

Where the Licensee provides a mobile broadband service on its licensed terrestrial system in the 900 MHz band the Licensee shall ensure a minimum network speed of 3 Mb/s downlink and 384 kb/s uplink.

Billing

[If it is appropriate to include a mobile broadband QoS service standard, then]

Unless agreed otherwise with individual customers, the Licensee shall provide transparent disaggregated paper bills to customers. Services which are charged based on usage should

clearly indicate the usage metric. Calls shall be charged on a per second basis. Data services shall be charged on a per usage basis.

The Licensee shall ensure that bills are accurately generated.

The Licensee shall take appropriate measures to detect cases of possible fraud including measures to identify rapidly abnormal calling patterns.

Review of QoS Standards and Directions by ComReg

ComReg may review the Quality of Service standards as set out in this section.

ComReg may, by direction in writing given to the Licensee, modify the Quality of Service standards as set out in part 4 of this schedule, and the Licensee shall comply with any such directions.

Part 5 Roll-out and Coverage Requirements

Definition of Coverage

Coverage of licensed terrestrial system in the 900 MHz band shall be calculated as follows:

GSM Systems:

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

UMTS Terrestrial System:

- For measurement purposes – an average field strength of 58 dBµV/m/5 MHz measured outdoors at a height of 1.5m
- For propagation prediction systems – a field strength of 58 dBµV/m/5 MHz over 95% of the area during 95 % of the time.

Other Terrestrial Systems:

- For measurement purposes – an average field strength of "X" measured outdoors at a height of 1.5m
- For propagation prediction systems – a field strength of "X" over 95% of the area during 95 % of the time.

The value of "X" will be set by ComReg to a level that is sufficient for the provision of services with this terrestrial system.

Where the Licensee has deployed more than one licensed terrestrial system in the licensed 900 MHz block it is the combined coverage of these systems that counts towards the minimum coverage and roll-out obligation as set out in this licence.

Where the Licensee has deployed a licensed terrestrial system(s) in "other designated frequency bands" which provide seamless service with systems in provides in the licensed 900 MHz block, it is the combined coverage of the licensed terrestrial system(s) in the licensed 900 MHz block and the other designated frequency band(s) that counts towards the minimum coverage and roll-out obligation as set out in this licence.

The list of "other designated frequency bands" is:

- The 1800 MHz band: 1710-1785 MHz and 1805-1880 MHz
- The 2100 MHz band: 1900-1980 MHz and 2110-2170 MHz

Minimum Coverage and Roll-Out Requirements:

[If symmetric:]

The Licensee shall ensure and maintain;

- 30% geographic coverage 4 years after the licence commencement date;
- 70% geographic coverage 7 years after the licence commencement date; and
- 90% geographic coverage 10 years after the licence commencement date.

[If asymmetric:]

[Should an existing 900 MHz mobile network operator obtain a new 900 MHz licence]

The Licensee shall ensure and maintain;

- 90% geographic coverage 3 years after the licence commencement date;

[Should an existing non-900 MHz mobile network operator obtain a new 900 MHz licence and provided existing coverage in their existing spectrum band (e.g. 2100 MHz) counts towards a 900 MHz coverage obligation]

The Licensee shall ensure and maintain;

- 90% geographic coverage 3 years after the licence commencement date;

[Should a New Entrant obtain a new 900 MHz licence]

The Licensee shall ensure and maintain;

- 30% geographic coverage 4 years after the licence commencement date;
- 70% geographic coverage 7 years after the licence commencement date; and
- 90% geographic coverage 10 years after the licence commencement date.

3 Reporting of Compliance

The Licensee shall, within 31 days of each relevant coverage and roll-out obligation notify ComReg that the Licensee has either (a) met the said obligation, or (b) that the Licensee has failed to meet the said obligation. Failure by the Licensee to so notify ComReg shall be deemed to indicate non-compliance with the relevant obligation.

Part 6 International Roaming

The Licensee shall establish and maintain as part of its Licensed Service an international roaming capability for its customers that is as wide and comprehensive as is practicable.

Where requested to do so, the Licensee shall provide to members of the public, maps from other operators with whom it has international Roaming Agreements showing the Coverage provided by them.

Part 7 Non-Ionising Radiation

The Licensee shall ensure that non-ionising radiation emissions[135] from the Apparatus operated by the Licensee are within the limits specified by the guidelines published by ICNIRP, any radiation emission standards adopted and published by ICNIRP[136], or its successors, from time to time, any radiation emission standards of the European Committee for Electrotechnical Standardization and any radiation emission standards specified by national and European Community law.

The Licensee shall ensure that the Apparatus operated by the Licensee is not installed or operated at a location in a manner which causes the aggregate non-ionising radiation emissions at that location to exceed the limits specified by any guidelines published by ICNIRP and that it complies with any radiation emission standards adopted and published by ICNIRP, or its successors, any radiation emission standards of the European Committee for Electrotechnical Standardization and any radiation emission standards specified by national and European Community law.

[135] Non-ionising radiation (NIR) is that part of the electromagnetic spectrum below 3000 million MHz (3×10^{15} Hz). Non-ionising radiation includes all radiations and fields of the electromagnetic spectrum that do not normally have sufficient energy to produce ionisation in matter and is characterised by energy per photon of less than about 12 eV and wavelengths greater than 100 nm. Radio waves, infrared radiation and visible light are examples of NIR. Electromagnetic waves at frequencies above 3000 million MHz are known as ionising radiation and this includes X-rays and Gamma rays as well as some Ultraviolet radiation.

[136] The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an independent, scientific organisation established in 1992. The ICNIRP was established for the purpose of advancing Non-Ionising Radiation Protection and in particular to provide guidance and recommendations on protection from NIR exposure. ICNIRP operates in co-operation with the Environmental Health Division of the World Health Organisation and the United Nations Environment Programme.

Part 8 Performance and Financial Guarantees

In relation to the licence conditions set out in the licence, in the event that Licensee fails to meet the performance targets as specified, the amounts guaranteed in Table 1 below, will be payable on demand to ComReg.

Part 4: QoS	€1 million
Part 5: Roll-out and Coverage	€2 million

The Licensee shall, before the licence commencement date, put in place a programme to measure and monitor compliance with the performance targets set out. The programme shall include the reporting procedures to ComReg and shall be in such form as agreed with ComReg or as may be specified by ComReg from time to time.

The Licensee shall, within 31 days of each relevant performance target notify ComReg that the Licensee has either (a) met the said performance target, or (b) that the Licensee has failed to meet the said performance target. Failure by the Licensee to so notify ComReg shall be deemed to indicate non-compliance with the relevant performance target.

Annex D: Draft MoU Between ComReg and Ofcom

DRAFT 09/09/09

Commission for Communications Regulation

Ofcom
OFFICE OF COMMUNICATIONS

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
TO BE APPLIED IN THE AREA INCLUDING
THE REPUBLIC OF IRELAND AND
THE UNITED KINGDOM

Page 1 of 7

DRAFT 09/09/09

1. INTRODUCTION

1.1. This Memorandum of Understanding (MoU) describes the procedures for the coordination 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 the United Kingdom the frequency bands 880 – 915 MHz, 925 MHz to 960 MHz, 1710-1785 MHz and 1805 – 1880 MHz are allocated to GSM public cellular telecommunications services according to [1].

1.3. In the UK these frequency bands may be made available for IMT services in the future.

1.4. In Ireland the frequency bands 880 – 915 MHz, 925 MHz to 960 MHz, 1710-1785 MHz and 1805 – 1880 MHz are allocated to GSM and Third Generation mobile telephony services.

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

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

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

1.8. This MoU applies in the regions of The Republic of Ireland and the United Kingdom.

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

1.10. Coordination of IMT/UMTS(FDD) services is based on the protection requirements for GSM given in Par 1.1 of annex 2 (08)02. [2]

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 coordination procedure in accordance with paragraph 4.

---

[1] United Kingdom Frequency Allocation Table, 2009

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

Page 2 of 7

3. CRITERIA FOR COORDINATION

3.1. Stations using the GSM technology will be coordinated according to [3, 4, 5]

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

3.3. Frequencies in the bands 925-960 MHz and 1805-1880 MHz for systems using preferential codes, or where centre frequencies are not aligned 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. 33 dBuV/m/5MHz at a height of 3 m above ground at the borderline between two countries, in the frequency band 925-960 MHz.

and

b. 39dBuV/m/5MHz at a height of 3 m above ground at the borderline between two countries, in the frequency band 1805-1880 MHz.

3.4. Radiocommunication stations for which the predicted field strength exceeds the values given in par 3.3 and 3.4 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, 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 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 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, coordination 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

---

[3] Memorandum of understanding on frequency coordination 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.
[4] Memorandum of understanding on frequency coordination 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
[5] Memorandum of understanding concluded between the administrations of the United Kingdom and Ireland on coordination in the 1710-1785 and 1805-1880 MHz frequency bands in force 1 September 1999

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 [6]:

- 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 values:

- DeltaN = 40 (N0m-N1000m)

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

DRAFT 09/09/09

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.

Page 5 of 7

7. CO-ORDINATION PROCEDURE

7.1. Exchanges of information for coordination/notification purposes shall be in the format set out in the HCM agreement Annex 2A (revised at Vilnius 2005) [7]

7.2. In the event of interference between authorised users of the band 1785 1805 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. Coordination request should be sent by licensee through the administration responsible for its authorisation.

8. REVIEW OF MoU

8.1. The coordination threshold and prediction methods defined in this MoU may be reviewed in the light of 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.

[7] Agreement between the Administrations of ... on the Coordination 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 XX Month 2009.

Signed on .....2009.

For the administration of The Republic of Ireland

For the UNITED KINGDOM administration

Annex E: Liberalisation in Other Member States

Belgium

BIPT has extended the current 900 MHz licences for all three MNOs to expire in 2015. Frequency assignments in the band will be restructured to align with a 5 MHz channel raster and this will also require two of the operators to relinquish some spectrum. Meanwhile, BIPT intends to auction 2 × 5 MHz of spectrum in the 900 MHz band for a new entrant.

France

ARCEP's refarming activity for the 900 MHz band is linked closely with the regulator's plans to licence a fourth 3G operator in the 2.1 GHz band.

In August 2009 ARCEP re-launched its 3G licensing process with a call for interested candidates for the 2.1 GHz spectrum. Applications are due to be received by the end of October 2009.

If licensing of a fourth 3G operator proceeds, the regulator is proposing to allocate 5 MHz of 900 MHz spectrum to the winner and 5 MHz of spectrum within the band will therefore need to be reclaimed from existing operators.

If a fourth 3G licence in the 2.1 GHz band is not awarded, the three incumbents will retain their existing 900 MHz holdings, although according to ARCEP there may be some "minor adjustments regarding guard bands."

ARCEP's proposed approach to reclaiming 900 MHz spectrum is a phased process whereby spectrum would first be freed up in locations outside of heavily populated areas, approximately one year after the new 3G licence is awarded. This would be followed by the release of spectrum in heavily populated areas within three to four years following the award.

Germany

In 2008 BNetza harmonised the expiry dates of all German GSM licences to 2016.

On 19 May 2009 BNetzA published draft measures for flexible spectrum usage rights, including a proposal to make operators' individual 900 MHz licences technology neutral.

BNetzA intends to publish the tender procedure for award of spectrum including 340 MHz of spectrum across the following bands: 1.8 GHz, 2 GHz, 2.6 GHz in addition to 72 MHz of digital dividend spectrum.

Refarming measures are not currently proposed to redistribute spectrum in the 900 MHz band, but BNetzA proposes to limit bidding rights in the upcoming spectrum

auction. Operators may bid for maximum of 2 × 20 MHz in the 800 MHz band, taking into account any existing 900 MHz assignments.

Italy

AGCOM's Decision of 17 September 2008 set out the process for rationalising existing frequency assignments in the 900 MHz band, and to permit the use of UMTS in the band. Currently use of 900 MHz spectrum remains limited to GSM.

After the amendment of the GSM Directive and entry into force of the Commission decision on the 900 MHz and 1800 MHz bands and the subsequent amendment of the National Frequency Allocation Plan, the Ministry may authorise 3G use upon request.

Netherlands

On 22 November 2007 the Ministry of Economic Affairs announced its intention to permit flexible use of radio spectrum in a number of bands, including those used for the provision of GSM and UMTS.

A "transitional framework" has been drafted to explore which licenses can be liberalised and what (if any) additional requirements are necessary.

Refarming issues may be addressed after February 2013 when all licences for in the 900 and 1800 MHz bands expire.

Norway

In 2005 the 900 MHz licences of Telenor Mobil and NetCom were renewed. The new GSM licences, in force until 2017, include a condition permitting liberalisation provided this is approved by the Ministry. Other 900 MHz licences (Mobile Norway) currently in force do not include such a provision.

In a hearing document of 1 February 2008 NPT said both the NRA and the Ministry are in principle in favour of opening the GSM bands for 3G use, as proposed by the EC.

On 21 July 2008 the Ministry announced that it allowed Telenor Mobile to trial UMTS in the 900 MHz band until the end of 2010.

Finland

The redistribution of spectrum in the 900 MHz band is due to begin by the end of 2009. The new licenses of the three operators will expire on 31 December 2015.

In April 2009, the redistribution of spectrum in the 1800 MHz band was completed, enabling the licensed operators to provide 3G services in the band. The liberalised spectrum in the 1800 MHz band remains exclusivly used for GSM at present.

Spain

A consultation published by the Ministry of Industry in July 2008 declared *inter alia* that reallocation of spectrum amongst 2G and 3G operators could be imposed for public interest reasons. On 11 March 2009 the Ministry published a summary of the responses received to this consultation.

There was general industry consensus on the need to allow 3G services in the 900 MHz band, but polarised views were expressed on the issue of redistributing existing spectrum assignments.

The Ministry has yet to make a decision on the review of existing 2G licences or the liberalisation/refarming of 900 MHz band.

Sweden[137]

Following a joint proposal by five MNOs for renewal of licences in the 900 MHz band in addition to spectrum refarming proposals, on Swedish Post and Telecom Agency (PTS) decided 13 March 2009 to renew licences and redistribute the existing spectrum assignments. The PTS Decision also permitted the introduction of new mobile broadband technologies in this band.

PTS assigned additional spectrum still available in the 900 MHz band and permitted the re-farming of the existing spectrum assignments so that Hi3G who did not have any 900 MHz spectrum would have access to 2 × 5 MHz of spectrum in the band, and all other operators would also have access to contiguous blocks of 2 × 5 MHz.

According to media reports, the operator Ventelo reported the arrangement made through the (PTS) to the EU Commission. This move provoked a succession of questions from the EC, leading the Swedish Government to order an investigation of the decision by the Swedish Competition Authority (SCA).

In its report, the SCA stated that according to its preliminary assessment, the cooperation agreement constitutes market sharing and violates competition rules, regardless of the fact that the agreement was approved by a State authority. The SCA is continuing its investigation into the agreement.

[137] Sources: http://www.thelocal.se/22224/20090922/ , http://lexuniversal.com/en/news/8939 , The Swedish Competition Authority's report Dnr 476/2009, 16/9/2009 , Yankee Group

Switzerland

A 2007 decision to renew existing 900 MHz GSM licences led to unexpected legal delays resulting in the Federal Communications Commission (ComCom) provisionally extended the licences in April 2008. Licences have now been renewed by ComCom up to the end of 2013 on a technology-neutral basis so that all 900 MHz licences will expire at the same time. ComCom may then implement a comprehensive reallocation of mobile assignments Meanwhile, two of the 900 MHz band operators are required to give up some spectrum in return for spectrum at 1800 MHz in order to facilitate a third operator which had less 900 MHz spectrum than the other two operators.

The licences which have now been renewed up to 2013 feature two new changes:

1) Technology-neutral assignments.

2) A minor reallocation of frequency assignments in the 900 and 1800 MHz bands.

In April 2009, the Federal Office of Communications (OFCOM) launched a consultation to consider the future allocation of spectrum in the following bands: 900 MHz, 1800 MHz, 2100 MHz, 2600 MHz, and in the 790 to 862 MHz range. The consultation period concluded in June 2009.

UK

In February 2009, Ofcom proposed to create a new licence for 2 × 5 MHz in the 900 MHz band by taking 2 × 2.5 MHz from each existing licensed MNO in the band, i.e. Vodafone and O2. Vodafone and O2 would be prevented from bidding in the subsequent auction.

Ofcom's proposals were opposed by the incumbent operators and the UK Government appointed an Independent Spectrum Broker (ISB) to find an agreed industry solution as an alternative to Ofcom's proposal.

On 16 June 2009 the government published the final 'Digital Britain' report informed by the ISB report, along with an impact assessment. It proposed:

- The liberalisation of the 2G (900 MHz) spectrum
- An exchange of 900 MHz spectrum by current holders (Vodafone and O2) for any acquisition of spectrum in the 800 MHz spectrum (released as part of the digital dividend) auction, at a ratio to be determined following technical arbitration work.

Annex F: Summary of Alternative Proposals Suggested in Response to Question 17 of Consultation 08/57

In responding to consultation Question 17 of 08/57 several respondents put forward alternative proposals for the future award of spectrum.

Telefónica O2's proposal suggested in response to 08/57

O2 proposed that ComReg should administratively assign each incumbent GSM operator with 7.5 MHz of liberalised spectrum, with the remaining 12.5 MHz of spectrum being awarded using an auction, subject to a 10 MHz spectrum cap.

O2 argued that this process should be conducted using a single award process for the entire 900 MHz band in 2009 with the assignment of spectrum using a two-stage combinatorial clock auction(Stage 1: award abstract lots only, Stage 2: award the positions of actual blocks).

O2 envisaged Stage 1 involving the reservation of abstract lots of 2 × 7.5 MHz for each GSM incumbent (i.e. an increase on each GSM operator's current spectrum assignment). The remaining unassigned spectrum (12.5 MHz) would then be awarded as five lots of 2 × 2.5 MHz each, with participation in this award open to all bidders, including the GSM operators, subject to 10 MHz cap on total holding of 900 MHz spectrum.

O2 envisaged that Stage 2 of the process would involve all participants bidding for the location of the respective lots that were won (or reserved) during Stage 1.

Under O2's proposal there should be no specific measures in place to reserve spectrum for a new entrant, but the spectrum cap would mean that *de facto* 5 MHz is reserved if there is interest in the 900 MHz spectrum from another operator. 02 argued that the 10 MHz spectrum cap should be removed immediately following the auction, or during the auction if demand is less then supply. All spectrum in the band should be awarded on a technology/service neutral basis.

O2 was of the view that ideally licences should be awarded on the basis of indefinite tradable licences.

O2 supported its proposal on the following grounds:

- It would minimise the potential for disruption to existing subscribers by protecting existing operators from the loss of 900 MHz assignments and/or strategic bidding.
- It would create investment certainty by allowing visibility for incumbents post 2011.
- It would ensure that spectrum would be available for a new entrant if there is interest.

Vodafone's proposal suggested in response to 08/57

In response to Consultation 08/57, Vodafone proposed that the existing licences at both 900 MHz and 1800 MHz should be liberalised and renewed until the expiry of the 2100 MHz 3G licences at the earliest (circa 2021). At 900 MHz, each of the three existing licencees should be administratively assigned additional spectrum so as to increase each incumbent holdings to 2 × 10 MHz. Under Vodafone's proposal, the remaining single block of 2 × 5 MHz should be auctioned to a new entrant. Incumbents should be excluded from participation in this auction by virtue of the 2 × 10 MHz spectrum cap. If however there is no demand for this block , then ComReg should engage with the existing 900 MHz licensees in order to divide the entire band equally between them.

Vodafone supported its proposal on the following grounds:

- The possibility of disruption to existing licensees and consumers would be minimised; and
- It would deliver all the benefits of the options proposed by ComReg in 08/57 (possibility of new entry etc.) without exposing the incumbents to the same risks in terms of losing spectrum at 900 MHz;
- Extending existing licences would maximise regulatory certainty allowing MNOs to make long term investments thus encouraging innovation;
- The allocation of a single block of 2 × 5 MHz to a new entrant would promote competition.

Meteor's proposal suggested in response to both consultation 08/57 (and 09/14)

Meteor put forward a similar proposal in response to both consultations. This involved the administrative assignment of additional 900 MHz spectrum to increase each GSM incumbent's 900 MHz spectrum assignments to 2 × 10 MHz. This reassignment would be for liberalised spectrum and would include their current assignments where possible.

Under Meteor's proposal, the remaining 2 × 5 MHz of unassigned spectrum would either be administratively assigned or awarded to a new entrant via an auction which incumbents would not be permitted to participate in

In its response to Consultation 09/14, Meteor added that as demand for 2G services dwindle, incumbents could, release blocks of 2 × 5 MHz each for reassignment via auction.

Meteor supports its proposal on the following grounds:

- It supports new entry into the 900 MHz band.

- It minimises disruption to consumers.
- It provides incumbents with the opportunity to deploy new services in the band.
- It supports future wide-band developments such as LTE.

Ericsson's proposal suggested in response to both consultation 08/57 (and 09/14)

Ericsson put forward the same proposal in response to both consultations. This involves reserving one 2 × 5 MHz block of liberalised 900 MHz spectrum for each existing GSM operator. ComReg should then conduct an auction for the remaining four blocks in a single combinatorial auction in 2009. These four blocks would be available to both existing and new operators to acquire at auction.

Ericsson supports its proposal on the grounds that:

- consumers would be protected from service disruption and
- Existing MNOs would be encouraged to invest.

Imagine's alternative proposal presented in response to 08/57

While Imagine did not provide an alternative proposal, it favoured Option C. Imagine was of the view that an auction should not be used for award of this spectrum, but it would support an auction only if spectrum was reserved for new entrants.

UPC's alternative proposal presented in response to 08/57

In response to 08/57, UPC was in favour of Option C, with the following modifications:

- Licences should be awarded using a beauty contest rather than an auction. UPC argues that A beauty contest should be used as spectrum should be awarded in such a way as to facilitate innovation and competition. Also the existing operators did not have to participate in an auction for their current spectrum assignments.

- Two blocks (totalling 2 × 10 MHz) should be awarded to a single new mobile entrant. UPC is of the view that 2 × 10 MHz is an appropriate amount of spectrum as consolidation of networks in other European markets suggests that the Irish market could not support two new mobile entrants.

- Licence fees for a new entrant should be set so as to take account of the costs to a new entrant in establishing a network.

The licences of the existing GSM licensees should be renewed and appropriate fees should be attached.

Annex G: Corrigendum on Current Frequency Assignments

In consultation documents 08/57 and 09/14 there was an error of 100 kHz in the details provided of existing frequency assignments in the 900 MHz and 1800 MHz bands. The correct frequencies of existing assignments are provided in the two diagrams below.

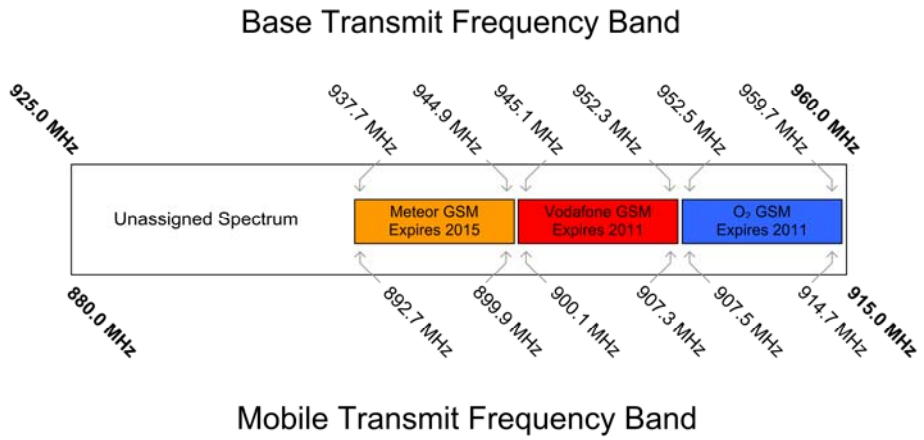

Figure 3 Existing Assignments in the 900 MHz Band

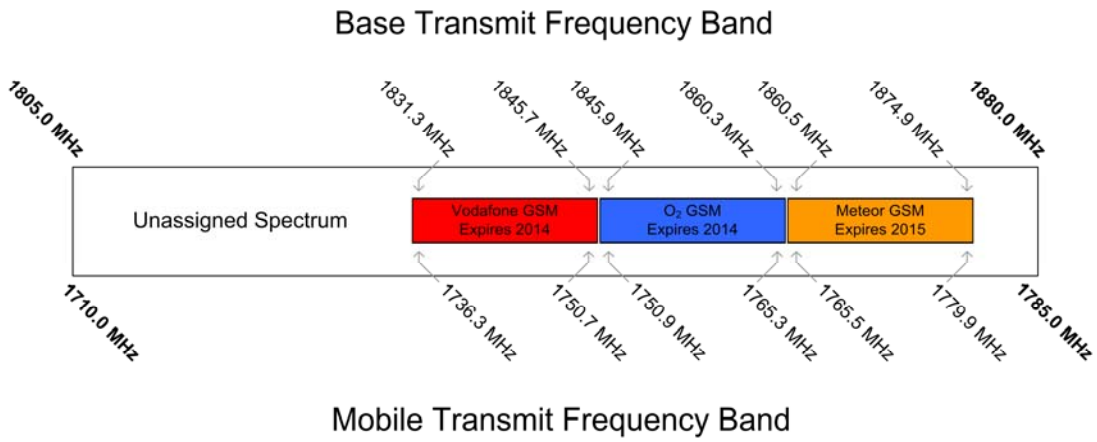

Figure 4 Existing Assignments in the 1800 MHz Band

Annex H: ComReg Analysis of Vodafone's RIA submission

Introduction

This document contains a summary of ComReg's analysis of *Vodafone's Regulatory Impact Assessment of ComReg's Proposed 900 MHz Spectrum Licensing Options*.

Background

While ComReg is conducting consultations in relation to certain matters, and is doing so by means of this document and the documents and processes that have preceeded it, there is no strict obligation on ComReg to conduct a RIA in relation to particular aspects. Nevertheless, ComReg has done so in relation to the project as a whole, in the interests of continuing to ensure transparency of its processes and as the outcomes of this project may significantly impact on the telecommunications sector in Ireland, particularly in the areas of mobile services and mobile broadband.

ComReg's previously stated general policy position is that it does not favour any specific approach for awarding spectrum rights, and prefers to consider each award on its own merits. However, and without prejudice to the overriding principle that each case must be assessed individually, it has a general preference to use a competitive mechanism to allocate scarce spectrum when demand is likely to exceed supply[138]. Amongst other things, a well designed competitive mechanism guarantees that the party that values the spectrum the most acquires the usage right. It is generally accepted in economic theory that this outcome maximises societal welfare, and, in the instant case, for example, assists in ensuring efficient use of spectrum and maximising benefits for users.

Comments on Vodafone's Analysis

Vodafone's analysis focuses on Options 1 and 2 as presented in Consultation 09/14 and then compares these options to its preferred option (Option 3).

Vodafone's Option 3 involves the "long term renewal without auction of the 900 MHz licences held by existing licensees, the expansion of the existing licences from the current 2 × 7.2 MHz assignments to 2 × 10 MHz assignments, and the allocation of the remaining 2 × 5 MHz of the 900 MHz spectrum band by agreement, or by auction or other assignment process as appropriate, to a new entrant to the 900 MHz band."

Vodafone incorrectly identifies the default option as a "do nothing" option and see this as unworkable as this would involve leaving licences expire without reassignment. It is ComReg's view that this is not the correct default option, which is, in fact, any option under which spectrum-use rights would be assigned or reassigned by means of an appropriate process, once licences expire and where demand is likely to exceed supply. ComReg has already noted the reasons that strongly suggest that demand is indeed likely to exceed supply in this award process.

[138] See ComReg 08/50 - Spectrum Management Strategy Statement 2008-2010 - July 2008 paras. 3.5 and 3.5.1.

Vodafone validly states that it is "a central conclusion of this assessment that the key cost impacts of ComReg's …options would arise in the event that one or more of the existing licensees were to fail to obtain any 900 MHz spectrum, or to obtain less spectrum than their current assignments."

In this regard, it is ComReg's view that this is a low-likelihood event (see Section 6.6 above), and this sentiment was indeed echoed by Vodafone in its bilateral meeting with ComReg on July 9th 2009 (the non-confidential minutes of which are published as ComReg document 09/73). In the event of spectrum-use rights being determined by means of the auction process proposed in this document, each current MNO would have the power to minimise the likelihood of such an outcome through pursuing an appropriate bidding strategy.

An auction would ensure that the business that values the spectrum the most - and will therefore probably produce the maximum in terms of welfare - will acquire the spectrum. ComReg acknowledges that this necessarily entails a possibility that one of the incumbents will (a) lose their entire 900 MHz spectrum or (b) end up with only 2 × 5 MHz of spectrum. The latter outcome would be more probable than the former, but in considering its implications, it should be pointed out that Vodafone espouses consigning any new entrant into the band to a situation where it could acquire, at most, 2 × 5 MHz of spectrum.

It should also be noted that the potential for consumer disruption is an important factor to which ComReg has had regard. It is important to point out that one firm currently competes in the voice and data markets without any GSM spectrum (900 MHz or 1800 MHz). Hence, the total loss of all 900 MHz holdings would not necessarily require that a firm leave the sector. Moreover, it is possible to deliver a 2G service using 1800 MHz spectrum alone.

Of course, it is more costly to deliver a 2G service under such circumstances but all of this would need to be factored into Vodafone's bidding strategy in the auction. If Vodafone cannot contemplate offering a reduced service to its customers (for fear that they will change operator) then it must take the costs that it can avoid if it obtains 900 MHz spectrum into account when formulating its bid.

The reasoning as outlined by Vodafone maintains an assumption that it keeps its current level of customers. However, such a situation would not likely pertain if Vodafone was to end up with no 900 MHz spectrum in the auction. In such circumstances, Vodafone would have a number of choices. It could, for example, make the additional investments required to use 1800 MHz spectrum (possibly in combination with 2100 MHz), or it could adjust the pricing/quality mix in its offer to customers, or it could seek an arrangement with another operator. In essence, the additional costs that Vodafone outlines in its submission, putting to one side whether they are correct in themselves, would only be incurred if the premium that it could charge customers for this were sufficient to cover its costs. It is also important to bear in mind that most MNOs have already made substantial investments so that they can use spectrum more flexibly in the future.

A further point is that if Vodafone does not acquire 900 MHz spectrum it is only because some other operator has done so. Moreover, in such a scenario, this operator must have valued this spectrum more than did Vodafone. Even if this results in some short term disruption, it could only be for a relatively short time as

both Vodafone and the new holder re-adjust/roll-out their networks. A number of mitigating factors are discussed in Section 6.6.

In its response to Consultation 09/14, Vodafone provided a critical analysis of the welfare analysis presented by ComReg in Annex F of Consultation 08/57. Vodafone to the view that this increase in welfare (from an increase in competition) would arise under all options (including Vodafone's Option 3). In doing this Vodafone conflated two separate exercises.

The welfare model in Annex F showed the impact of adding an additional player in an otherwise stable market. This is completely separate from the process of allocating spectrum to the firms that value it most. Under this scenario, the identity of the operators as well as the overall number of operators in the market may change.

The 900 MHz spectrum held by Vodafone was originally awarded in an administrative procedure to the previous semi-State company Telecom Eireann's mobile arm. Vodafone acquired the mobile operation when it was sold by Eircom a number of years ago. However, it must be recognised that spectrum trading is not permitted by legislation in Ireland. It cannot be concluded with any certainty that the current holders of the spectrum are, or for that matter will remain, the optimal holders of the spectrum from society's point of view.

Remembering that the best firms to be in the industry will produce higher consumer and producer surplus (sell more to consumers at lower cost and produce the amount demanded at minimum cost, respectively), the allocation of the usage right to 900 MHz spectrum will produce substantial additional benefits over the lifetime of the licence. In the welfare model used by ComReg the sum total of both consumer and producer surplus amounted to over €2 billion annually. If firms were to be selected on grounds other than how much they value the spectrum usage right, it would have a substantial impact on welfare over the period of the licence.

Vodafone makes the point that if the new entrant to the 900 MHz band was to be HG3I this would not result in the benefit described by ComReg in Consultation 08/57. The model developed by ComReg was designed to quantify the impact of an additional operator entering the mobile market. Vodafone, in introducing an actual operator which does not hold 900 MHz spectrum currently, is confusing the impact of an additional operator with the entry of a firm that values the spectrum the most (such as HG3I would be in the example used by Vodafone).

ComReg also notes a number of issues in regard to Vodafone's statements concerning revenues acquired by the State as a result of an auction.

First, the spectrum fees are intended to ensure that the firm that values the spectrum most succeeds in obtaining it. This has a substantial benefit to society. Hence, the raising of fees is not an end in itself but rather the means to achieve a much greater end, which is ensuring that the firms that value the spectrum the most are permitted the rights to use it. Vodafone's main claim that ComReg's licensing proposal would represent primarily a redistribution of economic surplus rather than an incremental gain for overall economic welfare should be seen in the light of Vodafone's implicit view that it is the best firm to hold usage rights.

Secondly, the argument that the sums raised change market behaviour is not accepted generally by economists and was indeed recently a major factor in the recent decision in the UK on mobile termination rates for 3G operators. The

arguments against this view are simple, yet persuasive. The argument is that the spectrum access fees will be passed onto consumers in the form of higher prices. This is in contradiction of the accepted view that firms in all markets choose their prices in order to maximise their profits. Thus, firms should always charge the highest price that the market will bear. Hence, there should be no impact on consumer outcomes. In ComReg's view, the arguments made by Vodafone on investment incentives are flawed. The impact of the spectrum access fees would be, as Vodafone states, a transfer from its profits (maximised in the same way as it would be if they were given the spectrum rights for free) to the Government's Central Fund.

Vodafone contends that its own Option as submitted in 09/73 and ComReg's Option 1 are the same in relation to the benefits of liberalisation. It is however worth noting that ComReg's Modified Option 1 allows for the possibility of the whole band being liberalised within a shorter timeframe.

In stating its views on the costs it would incur, Vodafone notes that the costs of migrating to 1800 MHz are relatively lower than to 2100 MHz. However, Vodafone notes that its 1800 MHz licence expires in 2014. Vodafone notes that accelerated 3G handset migration "beyond current forecast levels" might on a conservative estimate cost €100 per subscriber[139] in terms of increased subsidy cost. However, Vodafone does not face the immediate necessity of subsidisation of 3G handsets as it has access to 1800 MHz spectrum until 2014. Moreover, the additional cost of migrating customers to 3G should be seen in the context of the long-term agreement that the customer is likely to have to sign when they obtain the phone on a subsidised basis.

Vodafone holds that any MNO that lost 900 MHz spectrum would not be able to offer wholesale access, which would in turn, soften retail competition. This reasoning, however, ignores the fact that if Vodafone loses the right to use spectrum it can only be because another party has acquired it (by demonstrating at auction that they value it more). Such a firm would, of course, model the impact of a lack of wholesale supply into its business model and would only bid more if it intended to roll out its own network as quickly as possible, or had another viable business strategy in mind. Thus, it is hard to see any enduring impact on retail level competition, which may even intensify in terms of pricing to counteract any impact of disruption on quality.

Another point is that such an analysis on the part of Vodafone is partial. The firms currently in the industry will likely react to the prospect of new entry into the 900 MHz band by already moving towards more competitive pricing. In this way, the firms leave less room for the new entrant when they do in fact enter the market (the lowering of prices in advance of Meteor's entry being an example of this type of behaviour).

Vodafone's analysis of consumer surplus loss is based on a maintained hypothesis that the consumer surplus of its customers shrinks by 25%. No mechanism whereby this could happen is outlined, nor is the possibility of these consumers moving to other networks entertained. It is also counter to the arguments raised above about the option of price adjusting for quality (this point is conceded by Vodafone) and the impact on the competitive dynamic of the certain entry of a new player. In such

[139] ComReg 09/14s at page 25.

circumstances, consumer surplus must be expected to be increasing, rather than decreasing as outlined by Vodafone. Hence, the arguments advanced by Vodafone on this point remain unconvincing as, should such a situation arise, consumers are not inert and would demand a price change or other suitable reward. If this was not forthcoming they would likely move to another service provider.

Vodafone argues that the customers of other networks would also suffer if quality on the Vodafone network was reduced. It assumed that these consumers' surplus would fall by 5%, without motivation. Such a view is again based on an assumption that Vodafone will keep its current customers, who may have well changed supplier if the service they receive deteriorates. This would in turn reduce the potential harm to subscribers to other networks calling Vodafone customers.

Conclusion

The figures put forward by Vodafone appear somewhat speculative and based on a worst case scenario outcome where customers do not change networks nor networks respond to changed competitive circumstances.

The negative impacts on consumers appear to have been overstated for a number of reasons, including the possibility that prices can change to account for any loss in quality if one of the unlikely scenarios where disruption could occur came to pass. Moreover, consumers, if they are sensitive to quality, will always have the option of moving to another network.

Investments that would be required by a company that lost its 900 MHz spectrum would be a commercial matter for the undertaking concerned. Such investment would not be made unless the costs were outweighed by the benefits. In any case, a well established operator, such as Vodafone, would have insight into the costs of pursuing alternative solutions to 900 MHz and would build this into its bidding strategy in any auction.

Accordingly, having carefully considered Vodafone's RIA submission, ComReg remains of the view in principle in this case that the best way to assign spectrum usage rights is by a competitive auction. Although this does raise some potential for short term disruption, this appears to have been considerably overstated by Vodafone, and in a subjective manner, related to its own position vis-à-vis its own customer base. Moreover, there is only a small likelihood that any of the incumbents will end up with reduced 900 MHz assignments. Since Vodafone has both an established network and customer base, it has strong incentives to pay more for the use of 900 MHz spectrum than a similar company seeking to enter the market.

From ComReg's perspective, any valid costs associated with disruption only materialise if a company such as Vodafone is not successful at auction. Hence, in expected value, the extent of the likely losses would appear to be lower than Vodafone claims.

A suitably designed auction provides the highest degree of certainty that the entity that will produce the best welfare result for society and users over the period of the new 900 MHz licences will also be the entity acquiring the relevant usage rights. Thus, Vodafone could only be displaced in the 900 MHz band if another entity valued the spectrum significantly more than Vodafone, and in such a situation, this

would ultimately be reflected in substantially better outcomes for consumers over the period of the new 900 MHz licences.