Commission for
Communications Regulation

DotEcon's responses to the comments received from interested parties in response to ComReg consultation Document 15/140 on 3.6 GHz spectrum award

A report for ComReg

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DotEcon's assessment of comments on ComReg Document 15/140

DotEcon's summary, assessment and recommendations

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1. As ComReg's expert economic adviser, in this document DotEcon sets out its understanding of the responses received to ComReg consultation Document 15/140 that relate to issues on which DotEcon is advising ComReg. This document does not deal with responses related to the Draft Information Memorandum (Draft IM), which are covered in a separate document.
2. In this note we summarise the comments received from respondents grouping them by topic, and provide our assessment and recommendations on each of these topics. The topics covered in this note are:

1 Competition cap

3. Imagine and PermaNET disagree with the proposed competition cap of 150MHz. Imagine argues that this is likely to lead to an inefficient result as the optimal bandwidth for NGA type services is 20MHz and 150MHz is not a multiple of 20MHz. PermaNET states that bidders are likely to need 100MHz for NGA services. Given the interest in the band and ComReg not using an administrative award for FWA operators, PermaNET is concerned that a cap of 150MHz reduces the probability of smaller rural ISPs being able to acquire spectrum.
4. Vodafone agrees with a competition cap of 150MHz, but argues that if 3.6GHz holdings were to count towards a cap on 2.6GHz, this would be a serious disincentive to bid for 3.6GHz.

Assessment and recommendations

5. The reasons for setting the competition cap have already been explained in detail in previous documents (Document 15/72 and Document 15/140a). The cap is set to ensure there is enough residual spectrum to reasonably allow for three winners in each region, rather than to determine the exact bandwidth to be assigned to each winner.

6. Whether the cap is a whole multiple of 20MHz is irrelevant in determining whether the spectrum available will be assigned in a way that each bidder receives a multiple of 20MHz for a number of reasons:

    - First, the cap is only an upper limit on the maximum bandwidth that a bidder may bid for. A bidder can always bid for less, and therefore setting a cap that is a multiple of 20MHz would not guarantee that bidders will only bid for multiples of 20MHz. Conversely, bidders who wish to acquire a total bandwidth that is a multiple of 20MHz can ensure they will not win a different bandwith by only bidding on packages that include multiples of four B lots in each region.
    - Second, the spectrum available in the upper band (325MHz) does not divide neatly into 20MHz blocks. Therefore, even if the maximum number of winners were to win the maximum bandwidth allowed by a cap that were a multiple of 20MHz, the residual spectrum not assigned to these winners would *not* be a whole multiple of 20MHz. This means that unless some spectrum remains unassigned at least one the winners will win a total bandwidth that is not a multiple of 20MHz.

7. In addition, the competition cap determines the minimum amount of spectrum that is guaranteed to remain available for other bidders in the event that two bidders win the maximum bandwidth allowed for by the cap. In the upper part of the band, with the proposed cap of 150MHz, two bidders acquiring the maximum allowed would be assigned a total of 300MHz; this would leave 25MHz available for a third bidder (or a group of bidders). Therefore, the proposed cap ensures that a third bidder should still be able to acquire a minimum bandwidth of 20MHz in the upper part of the band (if it outbids any other competitors). A cap of 160MHz would not guarantee this, since if two bidders won 160MHz each, only 5MHz would remain available (in the upper part of the band) for a third bidder.

8. Another important issue is that the total bandwidth a bidder wishes to acquire may not depend only on the optimal block size for the services it intends to provide. For instance, a bidder may wish to purchase additional spectrum to internalise guard bands, thus

allowing them to operate without the need for inter-operator agreements. Therefore, even if the bidder wishes to use the spectrum in 20MHz blocks, it may wish to acquire a total bandwidth that is not a whole multiple of 20MHz.

9. PermaNET's concern has been addressed in our previous response. A lower competition cap could potentially limit the scope for future services that require a larger bandwidth and may impact on the range of demand that could be expressed in the auction.

10. Regarding the role of 3.6GHz holdings on any cap set for 2.6GHz spectrum, we note that it is not clear at present what other spectrum bands, if any, will be offered as part of the 2.6GHz award, when the award may take place, or what the structure of the relevant market(s) will be at that time. The allocation of regional 3.6GHz licences also creates uncertainty over the state of the market(s) and the relevance of 3.6GHz holdings for competition and future awards. Therefore, a competition assessment and any decisions on caps related to the 2.6GHz award would need to be made at a later stage.

2 Split assignments

11. Vodafone agrees broadly with the proposed spectrum packaging, but argues that there is some difference in equipment availability between spectrum in 3.4-3.6GHz and 3.6-3.8GHz, and that the process should allow for bidders to have part of their spectrum assigned in each of the two segments.

Assessment and recommendations

12. Vodafone reiterates and expands on this view in its comments on ComReg Document 16/22 (the Draft IM), suggesting that the negotiation phase could allow for non–contiguous assignments if approved by other operators. We will address all of these points together in our assessment of responses to the Draft IM.

3 Minimum prices

3.1 General approach to setting and level of minimum prices

13. 3IHL, as explained in its response to 15/70, disagrees with the general approach taken to the use of benchmarks to derive minimum prices. Both, 3IHL and Vodafone claim that the proposed minimum price is not sufficiently conservative and might, given the uncertainty around market value, risk choking off demand. In addition, 3IHL argues that frivolous bidders can be discouraged from participating at prices as low as 10% of the expected market value. Vodafone disagrees with the use of benchmarks, arguing that setting reserve prices based on

prices achieved in other countries can result in a ratcheting up of prices over time.

14. 3IHL believes that the risk of strategic demand reduction, which it claims has been cited by ComReg as a reason for high minimum pricing and a CCA format, is overstated and should be weighted against the risk of choking off demand. According to the operator, no evidence of strategic demand reduction in Ireland or elsewhere has been produced.

Assessment and recommendations

15. Responses to the general approach taken to determine minimum prices have been addressed in Section 3 of our updated benchmarking report.[1] Additionally, the general approach of using benchmarks as input to setting minimum prices is explained in ComReg's spectrum strategy 2016-2018 – response to consultation on Comreg's radio spectrum management strategy Document 16/49.

16. As stated in earlier responses, we agree that there is considerable uncertainty over the market value for the 3.6GHz spectrum. We have accounted for this by proposing conservative minimum prices at the low end of our estimates, and note that the recommendations for minimum prices have been revised down relative to the original proposals (which were already conservative) in recognition of the uncertainty over market value. In our original benchmarking report[2] we highlighted our belief that the recommended minimum prices were unlikely to choke off demand. We continue to hold this view, especially in light of the lowering of minimum prices in acknoweldgement of the uncertainty over market valuation. We note further that no convincing evidence has been presented in any of the responses to demonstrate that the proposed minimum prices are too high.

17. ComReg's reasoning for setting reserve prices with reference to a conservative estimate of market value, rather than at a low but non-trivial level is set out in its response to consultation on its spectrum management strategy, ComReg Document 16/49. It should be noted that ComReg is not "*setting reserve prices for spectrum at or*

[1] ComReg 15/140b (http://www.comreg.ie/_fileupload/publications/ComReg15140b.pdf)

[2] ComReg Document 15/72

above [] 'real economic value'"[3] as suggested by 3IHL but rather by reference to a conservative estimate of the market value of the spectrum. 3IHL has also requested clarification over what is meant by the term "*real economic value"*. Our understanding is that ComReg has used this term to simply describe the opportunity cost of assigning the spectrum to winning bidders i.e. the value of the spectrum to the "losing" bidders who could have been assigned the spectrum instead. Pricing based on opportunity cost (i.e. achieving the real economic value) is a standard feature of combinatorial clock auctions. As 3IHL points out, it is the case that in a truly competitive auction the prices achieved would be reflective of opportunity cost, and minimum prices are somewhat redundant (with regard to setting final prices). However, concerns over achieving real economic value arise when there is scope for bidders to keep final prices artificially low through collusive/gaming behaviour. Setting sufficiently high minimum prices helps to mitigate this risk by limiting the gains bidders can make through holding back on the extent to which they compete. 3IHL highlights a part of ComReg Document 15/70 that suggests the real economic value is what "…may be realised in a secondary transaction given that spectrum is tradable" . Our understanding of this is that ComReg was simply providing a real-world example of what the real economic value represents (i.e. the price that would be achieved if a licensee were to sell its spectrum to one or more operators via standard market mechanisms), which is not based on the premise that a user with higher value appears after the auction, as 3IHL suggests.

18. 3IHL's argues that the risk of strategic demand reduction is overstated when setting reserve prices, and that as a result minimum prices risk choking off demand. First, we note again that we have accounted for the uncertainty over the estimate of market value, and have thus set minimum prices conservatively to mitigate the risk of choking off demand. However, as discussed above, it is still important that reserve prices are set at a sufficiently high level to avoid creating incentives for strategic demand reduction and any other strategic behaviour (e.g. gaming, tacit collusion).

19. 3IHL elaborates that no evidence has been presented of strategic demand reduction in Ireland or elsewhere. We note that an effective auction design should minimise the scope for gaming. Therefore, a lack of observed evidence in Ireland does not necessarily imply that the risk of such behaviour did not exist. Rather, such behaviour might have been discouraged through effective auction design. Indeed, ComReg has actively set out to mitigate the risks of gaming

[3] *3.6GHz Proposed Spectrum Award- Response to Document 15/140 from Three Ireland*, p7.

or collusive behaviour (including, but not limited to, the scope for strategic demand reduction) in its award processes. We reiterate here that it is not just the threat of strategic demand reduction that provides the motivation for setting minimum prices with reference to an estimate of market value; other forms of gaming/collusive behaviour are also a concern, as is the risk of attracting speculative bidders that could compromise the efficiency of the award.

20. Identifying clear instances of strategic demand reduction in practice is extremely difficult without knowledge of bidders' true valuations. Nevertheless, we highlight below some independent studies that present evidence of strategic demand reduction in spectrum awards.

21. The following studies find evidence of strategic demand reduction in the 1994 FCC Nationwide Narrowband Auction:

    - Ausubel, Lawrence M., and Peter Cramton. "Demand reduction and inefficiency in multi-unit auctions." (2002).
    - Cramton, Peter C. "Money out of thin air: The nationwide narrowband PCS auction." *Journal of Economics & Management Strategy* 4.2 (1995): 267-343.

22. Other studies find evidence of strategic demand reduction in the German GSM Auction, including:

    - Grimm, Veronika and Riedel, Frank and Wolfstetter, Elmar, Low Price Equilibrium in Multi-Unit Auctions: The GSM Spectrum Auction in Germany (June 2001). CESifo Working Paper Series No. 506.
    - Klemperer, Paul. "Auctions: theory and practice." *Available at SSRN 491563*(2004).
    - Ausubel, Lawrence M., and Peter Cramton. "Demand reduction and inefficiency in multi-unit auctions." (2002).

23. Strategic demand reduction is also suspected to have occurred in the Austrian 3G auction, as discussed by Paul Klemperer in "How (Not) to Run Auctions: the European 3G Telecom Auctions" (European Economic Review, 2002).

24. A number of studies also report evidence of strategic demand reduction in lab experiments and controlled field experiments, including:

    - Goeree, Jacob K., Theo Offerman, and Randolph Sloof. "Demand reduction and preemptive bidding in multi-unit license auctions." *Experimental Economics* 16.1 (2013): 52-87.
    - Kagel, John H., and Dan Levin. "The winner's curse and public information in common value auctions." *The American economic review* (1986): 894-920.

- Engelmann, Dirk, and Veronika Grimm. "Bidding Behaviour in Multi-Unit Auctions–An Experimental Investigation*." *The Economic Journal* 119.537 (2009): 855-882.
- Engelbrecht-Wiggans, Richard and List, John A. and Reiley, David, Demand Reduction in Multi-Unit Auctions with Varying Numbers of Bidders: Theory and Evidence from a Field Experiment.

3.2 Benchmarking approach

25. In its response, Vodafone lists several points it found problematic with the benchmarking analysis:

    - Vodafone argues that the criterion for identifying outliers is not adequate. It states that some judgement is needed as to whether the market structure in a country is similar to that in Ireland or whether it should be excluded from the analysis. Specifically, artificial spectrum shortage or lack of a competing fixed network in some countries, most commonly outside Europe, can cause an increase in spectrum prices and should therefore be excluded.
    - It disagrees with the use of 2.6GHz benchmarks due to difference in value relative to 3.6GHz. It criticises ComReg for claiming that the value of 2.3GHz and 2.6GHz is a ceiling above which demand for 3.6GHz spectrum would be choked off.
    - It disagrees that the 2.3GHz, 2.6GHz and 3.6GHz band are likely to become similarly effective in the future.

Assessment and recommendations

26. In our benchmarking analsysis, we used an objective and transparent rule to identify outliers. If the effects mentioned by Vodafone were significant then they may result in high prices that would then be excluded as outliers (e.g. India, where the markets is often described as one with a substantial spectrum shortage, was excluded as an outlier from our analysis). Vodafone has not named any specific awards that it believes should be excluded but have not been excluded already.

27. Obtaining any objective measure of spectrum scarcity for each country would be difficult as it would depend not only on the spectrum made available, but also on the demand for spectrum and the market context (e.g. the fact that one country has not awarded certain bands does not entail that there is a spectrum shortage, as

there may be limited demand for that spectrum at that point in time). Our analysis does distinguish between European observations, observations since 2010 and European since 2010, noting that there is a trade-off between observations being more relevant (European since 2010 is the most relevant) and the number of observations. European observations are generally more relevant, and our recommendations are consistent with the evidence from these awards. Finally, the use of PPP exchange rates provides some correction for local economic conditions (in terms of income and consumer spending differences) across countries.

28. The reasoning for analysing 2.3GHz and 2.6GHz in addition to 3.6GHz benchmarks is explained in our original benchmarking report (ComReg document 15/72), as well as in the subsequent update (ComReg document 15/140b). We acknowledge the differences in propagation characteristics of these bands and agree that the value of 2.3GHz and 2.6GHz spectrum is higher than that of 3.6GHz. However, the number of 3.6GHz data points is rather limited and many of the awards are not recent. In addition, there does appear to be a degree of substitutability between 2.3GHz/2.6GHz and 3.6GHz spectrum, as acknowledged by Vodafone's argument that the lack of available 2.6GHz spectrum in Ireland may inflate the value of 3.6GHz spectrum. For these reasons we also considered that awards for unpaired 2.6GHz and 2.3GHz spectrum could be used in the benchmarking analysis, provided that the differences in expected values were considered and accounted for in the proposed reserve prices.

3.3 Population adjustments

29. ComReg used commuter-adjusted population figures to determine minimum prices in order for population figures to better reflect the actual number of people making use of services requiring radio spectrum in each region. 3IHL disagrees with this adjustment, arguing that spectrum *"might be more heavily utilised during evenings and weekends while users were at home"*. To support this claim, 3IHL provides usage data from its own network over one week, as well as a more detailed traffic profile for one day. Based on this data, the operator argues that the daily traffic volumes grows from about 16:00 and peaks between 18:00 and midnight, therefore suggesting that data usage is higher at home rather than during working hours while commuters are in urban areas, and the adjustment should be removed.

Assessment and recommendations

30. It should be noted that the commuter data takes into account population flow at all times of the day and night, not just a '9-to-5'

working day as suggested by 3IHL. The adjustment considers the flow of consumers between rural and urban areas over a full 24 hour period and reflects that spectrum rights are likely to be more valuable in urban areas than in rural areas.

31. We consider that there are good arguments to suggest urban areas would be more valuable than rural, and this is indeed refelected by the prices achieved in other spectrum awards where regional licences have been sold. The use of adjusted population figures is simply a method of approximating the difference when setting minimum prices, which we believe to be a reasonable approach. The final prices (and actual differences between regions) will be determined by the interaction of bidders in the auction.

32. 3IHL tries to show that mobile usage is higher at times when people are more likely to be at home than at their work place, but there is still significant usage at other times. The arguments provided by 3IHL therefore suggest only that the difference is limited, not that there is no difference at all. In any case, the resulting adjustments made to recommended minimum prices are fairly small, with minimum prices decreasing by up to 9% for rural areas and increasing by up to 14% for urban areas when using adjusted population figures compared to unadjusted figures. The minimum price of a national licence increases by 1.5% when using adjusted population figures compared to unadjusted ones. This is only a small adjustment to minimum prices and should not have a material impact on final auction prices.

33. We assume 3IHL's traffic data shows current mobile usage only, so any conclusions drawn purely on the basis of this data may not be reflective of usage for other services, such as existing fixed services or new future services. For example, and as noted in our updated benchmarking report, it might be that the spectrum is more heavily used to provide fixed wireless services for businesses in urban areas during the day, which would not be represented by the usage profile presented by 3IHL. Furthermore, the traffic data only demonstrates usage across all regions at different times of the day; it is not reflective of any differences between regions or the relative values placed by consumers on having coverage in urban/rural areas.

4 Auction workshops

34. PermaNET urges ComReg to run auction workshops by means of webcast or recording.

Assessment and recommendations

35. It is important that potential bidders have a full understanding of the auction rules and the process for participation in the auction, and workshops and seminars are no doubt a very useful tool for

facilitating this. It seems reasonable for the exact format of workshops and seminars to be determined closer to date, but PermaNET's suggestion might be a practical and useful solution, and thus we recommend that this option is considered when establishing the programme for bidder training.