



Commission for
Communications Regulation

DotEcon benchmarking Report (Updated)

A report for ComReg

Reference: ComReg 15/140b

Date: 22 December 2015

An Coimisiún um Rialáil Cumarsáide

Commission for Communications Regulation

Abbey Court Irish Life Centre Lower Abbey Street Dublin 1 Ireland

Telephone +353 1 804 9600 Fax +353 1 804 9680 Email info@comreg.ie Web www.comreg.ie

Benchmarking update

17 December 2015

1 Introduction

This report provides an update to our July 2015 benchmarking report. It includes revised benchmarking estimates, taking into account awards that took place between July and September 2015, as well as updated PPP, CPI and population data now available from the World Bank Database¹. It then considers responses to the consultation in relation to benchmarking and minimum prices. Finally, it discusses whether the proposed minimum prices should change in light of the new data and comments from stakeholders.

Throughout this document, we adopt the convention that *minimum price* refers to the total minimum price that a licensee would pay (in net present value) over the life of a licence. This comprises a *reserve price*, which is the starting price in the auction, and *ongoing fees* (SUFs). Auction winners would pay an *upfront fee* (SAF) greater than or equal to the reserve price on award of a licence and *ongoing fees* (SUFs) annually for the duration of the licence.

2 Updated benchmarks

2.1 Recent awards

Since our last benchmarking report, there has been:

- a 3.4GHz-3.6GHz auction in Slovakia (July 2015);
- a 4G auction in Turkey that included unpaired 2.6GHz spectrum (August 2015); and
- a 3.4GHz-3.8GHz auction in Romania (October 2015).

The Slovakian regulator awarded two blocks of 2x20MHz and one block of 20MHz using a SMRA format. Minimum prices were set at around €0.0047/MHz/pop after adjusting for a 15-year licence duration and taking into account relative PPP rates. Detailed

¹ These indicators are now available for 2014, whereas before, they were only available until 2013. In order to adjust the estimates, we use extrapolated CPI and PPP values for 2015. In the original analysis, these were calculated using 2012 and 2013 data. As 2014 data is now available, the updated benchmarking analysis uses PPP and CPI figures for 2015 based on an extrapolation of 2013 and 2014 data.

auction results were not published. However, the regulator announced that all blocks were sold at a total price of €2,433,706². This translates to about €0.010/MHz/pop for a 15-year licence in Ireland, using PPP rates and a discount rate of 8.63% (as used before in our previous report)³.

The Turkish multi-band auction included four unpaired 2.6GHz lots. One of these went unsold, one sold at the minimum price and the remaining two lots sold just above reserve. Minimum and auction prices from these two awards adjusted to a 15-year licence in Ireland are shown in Table 1. Note that the Turkish regulator published prices in Euros rather than in Turkish Lira. We report the price calculated by first converting official prices to Turkish Lira⁴ and then using PPP rates to convert prices to the Irish level. In brackets, we report estimates obtained from directly using Euros and adjusting only for licence duration, rather than first converting to local currency and then using PPP rates; however, these are less relevant as they do not take into account differences in purchasing power.

The Romanian 3.4GHz-3.8GHz auction ended on 27 October 2015 with five bidders acquiring spectrum. The lots sold just above the minimum prices, at around €0.012/MHz/pop adjusted for a 15-year duration in Ireland^{5,6,7}. 225MHz out of the 340MHz on offer were

² <http://www.teleoff.gov.sk/index.php?ID=10052>

³ Where licence awards involve annual or other on-going fees that can be anticipated at licence award these are included in the price for that award, discounting these future payments using a nominal discount rate. In practice, annual charges are often indexed by inflation, in which case it might be justifiable to use a lower real discount rate for these purposes. However, as we seldom know whether indexation will be applied, we have taken the more conservative assumption and used a nominal discount rate. Ideally, the discount rate used for this purpose would be that applicable to operators in the country of the corresponding award. However, this information is often not available so we have taken ComReg's WACC for the mobile market as an approximation. In any case, this is a minor issue, as only a small minority of observations have significant future payments.

⁴ Using the ECB exchange rate from the day of the auction (26/08/2015), <https://www.ecb.europa.eu/stats/exchange/eurofxref/html/eurofxref-graph-try.en.html>

⁵ Using the ECB exchange rate from the end of the auction (27/10/2015), <https://www.ecb.europa.eu/stats/exchange/eurofxref/html/eurofxref-graph-ron.en.html>

⁶ This includes an annual usage fee as reported in http://www.ancom.org.ro/en/ancom-established-the-details-of-the-auction-for-the-34-38-ghz-band_5442

⁷ Calculating minimum prices directly from the quoted Euro price gives an estimate of €0.006/MHz/pop, but this is less relevant as it is not corrected for purchasing power differences.

sold, suggesting that there was some demand at this price level but not for all frequencies. As with the Turkish auction, the Romanian regulator reported official prices in Euros rather than in local currency. In brackets, we report estimates obtained from directly using these official Euro prices without PPP adjustments.

Table 1: Prices for recent awards converted to a 15-year duration

Award	Band	Price per MHz pop	Minimum price per MHz pop
Slovakia 3.4GHz-3.6GHz	3.4GHz	€0.0098	€0.0047
Turkey 4G	2.6GHz unpaired	€0.0419 (€0.0190)	€0.0401 (€0.0182)
Romania 3.4GHz-3.8GHz	3.4GHz-3.6GHz	€0.0122 (€0.0058)	€0.0118 (€0.0056)

We are aware that the analysis may need updating in light of recent awards that have not yet been concluded at the time of writing. In particular, we expect a Bulgarian 2500MHz-2690MHz award⁸ and a Moldovan multiband auction (including 2.6GHz and 3.4GHz-3.8GHz spectrum)⁹ to take place around November or December 2015.

2.2 Updated indicators

We estimate average prices taking into account the recent awards mentioned above as well as updated PPP, CPI and population figures from the World Bank. As before, these estimates exclude awards where all lots were sold at reserve, as the minimum price may have been set too high in these cases or those awards may not have been competitive and so reveal a reasonable estimate of market value.

Fixed, transparent criteria are used for defining and excluding outliers:

⁸ As announced by CRC at http://www.crc.bg/news.php?news_id=370&lang=en

⁹ As announced by ANRCETI at http://www.anrceti.md/lansare_concurs_25092015

- observations that lie more than three standard deviations away from the sample mean; or
- observations that lie more than three times the interquartile range above the 75th percentile.

Updated average prices are shown in Table 2. The Turkish price estimate reflects the conversion of official Euro prices to Turkish Lira using the official exchange rate and then to the Irish level using PPP rates (i.e. the price that is *not* in brackets in Table 1).

Table 2: **Updated** average prices per MHz per capita for a 15-year Irish licence

	All	European	Since 2010	European since 2010
All	€0.0221	€0.0153	€0.0367	€0.0325
3.6GHz	€0.0157	€0.0071	€0.0086	€0.0086
2.6GHz	€0.0313	€0.0348	€0.0469	€0.0469
2.3GHz	€0.0285	€0.0086	€0.1149	NA

As in our original report, 2.6GHz and 2.3GHz only include unpaired spectrum, whereas 3.6GHz awards include all spectrum.

For ease of comparison, Table 3 reports average prices as stated in the original benchmarking report.

Table 3: **Original** average prices per MHz per capita reported in July 2015

	All	European	Since 2010	European since 2010
All	€0.0236	€0.0142	€0.0715	€0.0386
3.6GHz	€0.0158	€0.0064	€0.0038	€0.0038
2.6GHz	€0.0297	€0.0333	€0.0473	€0.0473
2.3GHz	€0.0279	N/A ¹⁰	€0.1125	N/A

¹⁰ This average is missing from the original table but it should be €0.0084.

Most of these prices are broadly similar to those in our original benchmarking report. However, there are some differences, primarily due to changes in the observations qualifying as outliers within the enlarged dataset:

- The average for all bands since 2010 is lower than before because the Indian 2010 auction is now excluded as an outlier in the sample group of observations since 2010.
- The recent 3.6GHz average (European and overall) is higher than before as it now includes the second Slovakian 2015 auction and the Romanian auction, which achieved higher prices than the previous auction in this sub-group¹¹.
- The new Turkish observation is higher than the overall and European 2.6GHz estimates, thus slightly increasing those averages; whereas it is below average in the sample groups since 2010, thus slightly decreasing those averages.

Overall, none of these changes due to new data are sufficiently material to suggest changes to the range of €0.015-€0.025 (per MHz per capita) for minimum prices recommended in our previous report.

3 Responses to consultation

This section summarises responses to consultation in relation to benchmarking and minimum prices and sets out our responses.

There are two general points relating to this benchmarking analysis that we wish to highlight upfront. First, we believe that there may have been some misunderstanding amongst respondents regarding the intention of the exercise. Its aim is *not* to estimate final prices likely to be established in the auction, but rather to choose a starting point that is likely to be below final prices, yet high enough to discourage speculative bidding and reduce gaming incentives. To achieve this, the benchmarking provides a *range* of market value estimates for the spectrum reflecting uncertainty. We choose a conservative minimum price from this range that is likely, we believe, to be *below* final prices.

Second, there is a large amount of uncertainty involved in this particular benchmarking exercise due to the limited sample size and the variety of potential uses of this spectrum. However, the presence of uncertainty does not invalidate the benchmarking

¹¹ In the previous benchmarking report, the Slovakian 3600-3800MHz auction was the only observation since 2010.

analysis. Price estimates may be uncertain yet still contain useful information for determining minimum prices.

Overall, there was no compelling evidence presented within the responses to consultation to suggest that the originally proposed minimum prices are above market value. Nevertheless, there is uncertainty around estimates of the value of the 3.6GHz spectrum, as our original report acknowledged. Some of the responses identified possible further sources of uncertainty (for example, expectations of the potential value of using the spectrum for WiMax may have been overstated at the time of earlier 3.6GHz auction). On this basis, whilst our previous recommendations for minimum prices were already conservative, we consider that there may be grounds for somewhat reducing the minimum prices recommended in our previous report to reflect this uncertainty (even though our central estimates of spectrum value are largely unchanged). Having done so, we can be reasonably certain that setting the minimum price at this level is unlikely to choke off demand.

The remainder of this section discusses comments raised with respect to specific questions set out in ComReg's consultation.

3.1 Benchmarking as the approach to determine a conservative minimum price

ComReg's consultation document asked whether operators agree that benchmarking should be used to determine a conservative minimum price. The responses to this question can be categorised into:

- general issues with the approach;
- specific issues with the choice of the data sample and exclusion of outliers; and
- questions about specific awards that were not included in the original analysis.

3IHL and Ripplecom disagree with the entire approach ComReg has taken to setting minimum prices. 3IHL argues that minimum prices set close to market value are unnecessary and risk leaving spectrum unsold. Ripplecom argues that benchmarking should not be used to determine minimum prices because the Irish market is unique in terms of population distribution and the NBP intervention.

Most responses express the opinion that the proposed minimum prices are too high. Operators disagree with some aspects of the benchmarking analysis, mainly that:

- it includes data from 2.3GHz and 2.6GHz awards; and
- it includes data from non-European awards.

Viatel disagrees with DotEcon's argument that older 3.6GHz awards are likely to underestimate present market value, which may now reflect expectations of use of the spectrum for LTE whereas past valuations did not. In Viatel's view those older awards may have been based on valuations that made excessively optimistic assumptions about the profitability of services based on WiMax.

Eircom claims that our estimates are skewed upwards by the inclusion of outliers. Viatel and Imagine note that our analysis does not include failed awards and that it needs updating to take into account recent awards.

Response: Approach to setting minimum prices

3IHL argues that ComReg should set low but non-trivial minimum prices, rather than basing them on market value, to eliminate the risk of choking off valid demand, which would be against ComReg's statutory objectives. However, we note that this would amount to an entirely different basis for setting minimum prices to that proposed by ComReg. ComReg's approach of setting minimum prices materially above a low but non-trivial level is in line with other regulators' decisions. For example, Ofcom decided in relation to the UK 4G auction *"to set higher reserve prices than the low but non-trivial reserve prices that [it has] set in previous auction. (...) [It] consider[s] that the reserve prices [it has] set appropriately balance the advantages and disadvantages"*¹².

The currently proposed approach to setting minimum prices is based on a *conservative* estimate of market value, which *already* seeks to ensure that the risk of choking off demand is controlled. It is not necessary to move to low (but non-trivial) minimum prices in order to contain this risk to an acceptable level, as benchmarks already provide some information about likely market value that allow us to manage this risk. Setting low (but non-trivial) minimum prices has the downside that it could create incentives for collusion and other forms of gaming aimed at lowering final prices. In turn, the distorted bidding behaviour this would create risks an inefficient outcome contrary to ComReg's statutory objectives. Furthermore, minimum prices should not be set so low that the award attracts speculative bidders who may gamble on spectrum subsequently having greater resale value in the secondary market.

Ripplecom's argument that international benchmarking does not apply to the Irish market because of the distribution of rural population and the planned NBP intervention is not accompanied

¹² <http://stakeholders.ofcom.org.uk/binaries/consultations/regs-800mhz/statement/statement.pdf>, A2.34

by any specific evidence to indicate that the Irish situation is so exceptional as to invalidate the benchmarking approach. The proposals for minimum prices already take into account differences between rural and urban regions, as explained in Section 3.4, and the approach is tailored to account for the specifics of the Irish market. The use of PPP exchange rates provides some correction for local economic conditions (in terms of income and consumer spending differences) across countries. We acknowledge that non-European benchmarks may not be as relevant as European ones and have reported these separately. However, given the limited number of data points, it is appropriate to include non-European benchmarks provided these are interpreted with care. Clearly there is uncertainty about the likely value of 3.6GHz spectrum in Ireland, but this is explicitly acknowledged and addressed by setting minimum prices at the lower end of the range of plausible benchmarks.

Additionally, Ripplecom argues that small FWA operators cannot afford international market rates for 3.6GHz spectrum due to the failure of previous governments to invest, while Vodafone states that high prices that are not aligned with the NBP might distort the choice between wireless and wired solutions. However, as noted above, Ripplecom's point is not accompanied by any specific evidence to indicate that the Irish situation is so exceptional as to invalidate the benchmarking approach. In respect of Vodafone's point, we note that the Government has already determined that any market failure in the provision of broadband services is to be addressed through the NBP.

Throughout, we have acknowledged uncertainties and for this reason minimum prices are proposed on a conservative basis with some allowance made for differences in value between rural and urban regions, in particular, the proposed minimum price for rural areas was at the lower end of price estimates. With these caveats, benchmarking provides a valuable input to the setting of minimum prices provided the results are interpreted carefully; we see no reason to change the approach in this regard. Nevertheless, in light of the comments received and the updated benchmarking results, there may be justification for a modest downward adjustment to the proposed minimum prices to further account for the uncertainty regarding the value of the 3.6GHz spectrum within the Irish market.

The proposed minimum prices should in any case be kept under review until commencement of the proposed award, as ComReg has done for previous awards.

Response: Choice of benchmarks

We noted in the original benchmarking report that prices from other 3.6GHz awards are the most direct comparators for setting minimum prices. However, since there is only a limited sample of

previous 3.6GHz awards in Europe, with many awards being quite old,¹³ the analysis also included other bands that could reasonably be considered comparable to the 3.6GHz band today, as well as non-European awards.

It seems broadly agreed amongst respondents that price estimates from the 2.3GHz and 2.6GHz bands should form an upper bound on the value of 3.6GHz due to differences in the propagation characteristics (as noted by Vodafone, eircom and Imagine), with these bands also being more developed for mobile applications. The minimum prices proposed by ComReg are below our 2.6GHz and 2.3GHz benchmarks. For rural areas the minimum price proposed by ComReg corresponds roughly to the 3.6GHz average from our benchmarks, whereas for urban areas it is closer to the overall average of all three bands to reflect the likely greater range of possible uses for spectrum (such as greater demand for mobile use) and likely lower roll-out costs.

Vodafone argues in its response that the uses of the 3.6GHz band are more comparable to FWA services; therefore, ComReg should compare the value of this spectrum to other bands used for FWA rather than to mobile bands, which typically have a higher value. Similarly, Imagine claims that the justification for comparing the value of 3.6GHz spectrum to mobile bands is weak given uncertainty about mobile broadband use at 3.6GHz.

The essence of these arguments is that the 2.3GHz and 2.6GHz bands are better suited for mobile applications and that any benchmark valuation of the 3.6GHz spectrum should be based on the assumption that it is used only for fixed wireless applications (whether based on LTE or other standards). However, this view is unduly conservative. First, in the long run we can expect all three bands to become similarly effective (subject to slight differences in propagation characteristics) in delivering mobile data services as differences in equipment availability lessen. Second, anticipated data growth may mean that the 2.3GHz and (to a lesser degree) the 2.6GHz band may become constrained, especially for urban areas, and that other high frequency bands may become important for deployment of mobile services in the future.

Therefore, a reasonable position is that the current anticipated value of 3.6GHz should be intermediate between historic prices of 3.6GHz (based on fixed wireless deployment, often using WiMax) and the average value of similar high frequency mobile bands (i.e. unpaired 2.3GHz and 2.6GHz spectrum). Our recommendations are based on this assumption; indeed the range of €0.015-€0.025

¹³ Only one 3.6GHz award in the original benchmarking exercise took place in the last five years and resulted in prices above reserve prices for that award.

recommended in our previous report reflects the average value of 3.6GHz from historic awards at the lower end and a (very conservative) estimate of possible (unpaired) 2.3GHz and 2.6GHz value at the upper end. However, it is clearly debateable where within this range the minimum price for 3.6GHz spectrum should be set for this auction. Therefore, we recommend that somewhat greater weight be given to these uncertainties in the light of the comments received at consultation; this is reflected in a somewhat lower recommended range for minimum prices set out in our conclusions below.

Viatel argues that older 3.6GHz awards cannot be assumed to understate the value of this spectrum today because of strong expectations about WiMax-based services at the time. We agree that *in retrospect*, it is possible that expectations at the time about the value of WiMax may have proved over-optimistic given that the technology ultimately turned out not to be widely deployed (at least in Europe), although it is difficult to quantify the impact. However, any acquisition of spectrum must be valued according to expectations about how it might be used in future given the information available at the time; with the benefit of hindsight those expectations might prove to have been too optimistic or too pessimistic. Even if Viatel was correct in its argument, the fact that WiMax has not been widely deployed in Europe does not mean that the expectations held at the time when 3.6GHz spectrum was acquired were necessarily irrational; these expectations could have factored in a number of future possibilities with various upsides and downsides, only one of which will actually come to pass. Similarly, any spectrum acquisition made now will have to be made on a forward-looking basis.

When this spectrum was originally awarded, there were no harmonisation measures in place or anticipated, whereas now harmonisation of the 3.6GHz band is in place and likely to have a strong effect in enhancing the value of the spectrum. Therefore, even if there were some uplift to historic spectrum values in the 3.6GHz band caused by over-optimistic expectations about WiMax, there are still good reasons to expect the impact of current moves to standardisation around LTE to have a stronger effect.

Given that no specific evidence has been offered to support the assertion that historic 3.6GHz valuations were irrationally exuberant, we see no particular reason to down-rate any of the historic 3.6GHz auction prices for this reason. Nevertheless, we acknowledge that this is a possible further source of uncertainty in assessing the extent to which we can reasonably expect current valuations of 3.6GHz to exceed historic ones.

In our original report we made clear that the setting of minimum prices should reflect uncertainty about the relevant benchmarks. This was the reason for making conservative proposals, in particular using the lower end of the range of estimates for setting rural minimum prices. Nevertheless, we believe that the additional

sources of possible uncertainty raised by respondents (e.g. the possible effect of optimistic expectations about WiMax) mean that there is some limited scope for exercising further caution in setting a minimum price for this auction, even though updated data (presented in Section 2 above) would not by itself suggest any need to revise the recommendations of our previous report.

Response: Outliers

Eircom states that the approach is skewed upwards by the inclusion of outliers. However, the analysis was careful to exclude outliers, using standard definitions of what constitutes an outlier¹⁴. In particular, prior to undertaking the analysis of the data, we have adopted a transparent and objective rule to exclude outliers and applied this consistently, rather than dropping data points in an *ad hoc* manner in the course of the analysis. In particular, we excluded observations that:

- lie more than three standard deviations away from the sample mean; or
- lie more than three times the interquartile range above the 75th percentile.

This is a symmetric¹⁵ criterion, dropping observations at both the extreme lower end and extreme upper end of the sample.

The chart included in Eircom's response labels:

- Switzerland, Jordan and Bahrain (all 3.6GHz) as outliers for all data samples; and
- Bulgaria (3.6GHz) and Spain (2.6GHz) as outliers for the European data sample.

We agree that Switzerland, Jordan and Bahrain are outliers, and this is reflected in our original benchmarking report. We also agree that Spain is an outlier for the European sample, and it is treated as an outlier in our original benchmarking report (although it is very close

¹⁴ There are a variety of methods to identify outliers. We use two fairly common approaches as, for example, reported in <http://www.itl.nist.gov/div898/handbook/prc/section1/prc16.htm> (3 times IQR) and http://docs.oracle.com/cd/E17236_01/epm.1112/cb_statistical/frameset.htm?ch07s02s10s01.html (3 times standard deviation away from the mean)

¹⁵ The symmetric criterion of being more than three times the interquartile range below the 25th percentile does not exclude any observations, so we do not list this.

to the outlier threshold and its status as an outlier is thus sensitive to any updates or inclusion of new data points).

The Bulgarian observation is an outlier when considering European 3.6GHz awards. However, when considering a sample of all bands in Europe, it does not fulfil either of the above conditions for being classified as an outlier. The Bulgarian observation is therefore excluded only when considering European 3.6GHz awards, but not when considering all European awards.

Table 4 summarises outliers from the updated analysis. Where these correspond to the outliers found in the original analysis, only one entry is shown. Where the outliers differ, the original ones are shown in brackets underneath the updated outliers.

Table 4: Summary of outliers in updated analysis (outliers in previous analysis where different to updated)

	All	European	Since 2010	European since 2010
All	CH, BH, JO, IN	CH, ES	IN (-)	-
3.6GHz	CH, BH, JO	BG, CH	-	-
2.6GHz	-	-	-	-
2.3GHz	IN	-	-	N/A

The updated analysis shows that the selection of outliers is somewhat sensitive to small changes in economic indicators and new data points, as some observations can be very close to the threshold for being excluded as an outlier. This does not invalidate the usefulness of benchmark data, but does mean that when using these estimates as a basis for proposed minimum prices, care needs to be taken to reflect the high level of uncertainty.

Response: Recent 3.4-3.8GHz awards

Since the last benchmarking report was published, 3.4GHz-3.6GHz licences have been awarded in Slovakia (July 2015), and Romania (October 2015). The results from these awards are reported in Section 2.1.

These price estimates are slightly lower than the lower end of the range proposed in our previous report (i.e. €0.015) and it should be noted that some lots went unsold in the Romanian auction. However, market conditions in Romania and Slovakia may be less

favourable than in Ireland. For instance, the Romanian 4G auction resulted in 90MHz of unsold spectrum¹⁶ across the more important 2.6GHz and 800MHz bands, which may be an indication for this.

Overall, the Romanian and Slovakian benchmarks do not amount to convincing evidence for setting lower minimum prices in Ireland.

Viatel further suggests that minimum prices should take into account unsuccessful awards, such as a 3.8GHz award in Moldova that failed to attract interest in March 2015. As in Romania, minimum prices for this award were announced in Euros. When converting prices back to Moldovan Leu¹⁷ and then using PPP rates to adjust for purchasing power differences, minimum prices are around €0.014/MHz/pop.¹⁸ As market conditions in Moldova are likely to be very different from those in Ireland, the failed award at a similar minimum price to that proposed in Ireland does not, in our view, provide compelling evidence that a minimum price of €0.014/MHz/pop would choke off demand in Ireland.

Viatel also argues that the benchmarking data set is missing awards from Belgium and France. However, neither of the awards referred to by Viatel were conducted using an auction process. Our original report was clear that only competitive award process using auctions were considered. This is because an administrative award only gives an indication of market value if prices were set according to estimates of market value. Otherwise these prices can form an *upper bound* if spectrum failed to be awarded or a *lower bound* if it was awarded.

The Belgian award took place in March 2015, so provides a useful crosscheck. Regional 3.5GHz licences were allocated through a beauty contest with prices set at €27,600/MHz/year, which corresponds to around €0.022/MHz/pop for a 15-year licence in Ireland. Only one operator applied for licences in several regions. This suggests that there was demand for spectrum at this price, but not sufficient for all the available lots. This is only a single award and significance should be weighed accordingly, but it provides some evidence that there could be a small risk of unallocated lots at the upper end of our originally recommended range for the minimum price in ComReg's proposed award (i.e. €0.025). However, this risk is likely to be insignificant for urban areas where there is

¹⁶ http://www.ancom.org.ro/en/uploads/links_files/Rezultate_licitatie_-_final_EN.pdf

¹⁷ Using official exchange rate from the day of the announcement of the failed award (23/03/2015), see <http://www.bnm.org/en>.

¹⁸ Calculating prices directly from the quoted Euro prices gives around €0.006/MHz/pop for a 15-year licence without adjusting for PPP, but again this is less relevant as there is no correction for purchasing power differences.

likely to be demand for mobile network capacity, given that average benchmarks for 2.3GHz and 2.6GHz lie at around €0.030 and higher. Nevertheless, it suggests that some caution is appropriate, which is reflected in our revised recommendation for a somewhat lower range.

The award of 3.5GHz spectrum in France and a subsequent spectrum trade took place in 2005 and 2006 respectively. We consider that these are not sufficiently recent to be relevant.

3.2 SAF/SUF split

Some of the mobile operators agree with the proposed split between upfront and annual fees. However, most of the FWA operators propose a smaller upfront part relative to the on-going fees, in order to give smaller providers a better chance of competing in the auction. The proposed splits across the alternatives set out by FWA operators range from 20/80 (Ripplecom) to 40/60 (Eurona Ireland Ltd), with most suggesting a 25/75 split¹⁹.

Additionally, Viatel requests an example of the annual fees calculation and questions whether the mobile operators' discount rate should be applicable for this calculation.

Response

The reason for a significant upfront payment is to discourage non-credible bidders from participating in the auction. This is in the interest of all serious bidders, as it will help ensure an efficient auction outcome and an efficient use of the radio spectrum. Speculative bidders might win spectrum in the expectation of selling or sub-leasing to other parties, rather than deploying services.

We acknowledge that for the Irish 3.6GHz auction there is likely to be a greater range of bidders (of significantly different size and financial strength) than in some other spectrum auctions. On this basis, there may be some case for rebalancing the split of the minimum price between up-front and annual fees relative to the approach that ComReg has taken in other recent auctions (such as the MBSA, where the split was 50:50). However, at the same time it is important to maintain sufficiently high minimum SAFs to

¹⁹ Proposed by Aptus, Digital Forge, KerNet Broadband, BB Net, Airwave and a joint response from four operators.

discourage non-credible bidders, though licence conditions also have a part to play here.

If the upfront part of the fee were to be lowered, as we propose here in response to additional concerns about uncertainty of the benchmark estimates, whilst leaving the on-going fee at a broadly similar level to that previously proposed, then this would result in a split with a higher on-going proportion, as suggested by the FWA operators. This would then be re-balanced to a more equal split if prices in the auction rose above reserve.

To strike a balance between discouraging speculative bidders and accounting for the ability of smaller operators to make the upfront payments, we consider that in this particular award a 40/60 split between the SAF and SUFs could be appropriate to encourage smaller bidders without creating much additional risk of speculative entry.

Using the region “Galway city & Suburbs” as an illustration (as Viatel does in its submission), real annual licence fees would be calculated as shown in Box 1 (on the assumption of a 40/60 split between minimum SAF and ongoing SUFs, and using the new proposed minimum price of €0.015/MHz/pop in urban areas)²⁰.

²⁰ For the purposes of determining the split of the minimum price between an upfront SUF and an on-going SAF, we have used a real discount rate. This is because ComReg intended to increase SAFs in line with inflation. Therefore, if we are discounting future SAFs that are constant, then implicitly we have already converted these payments to real terms and so a real discount factor should be used. Note that the determination of SAFs should not be critical. To the extent that bidders anticipate SAFs (which are clearly set out, including ComReg’s policy on indexation), then spectrum valuations and so auction prices should reflect these.

Box 1: Example SUF calculation

A constant real annual fee, SUF, needs to satisfy

$$\sum_{t=0}^{14} \frac{SUF}{(1+d)^t} = 0.6 \times \text{Min price}, \text{ where } d \text{ is the discount rate.}$$

In this example, we have $d = 0.0863 - 0.015 = 0.0713$ and $\text{Min price} = \text{€}7,000$

This gives $\text{annual SUF} = \frac{0.6 \times \text{€}7,000}{9.6777} = \text{€}434$, where $\frac{1}{9.6777}$ is the annual discount factor.

3.3 Proposed range of minimum prices for urban and rural areas

As discussed above, most respondents consider that the proposed minimum prices are too high. Vodafone believes that the proposed level might lead to unsold lots, whereas some FWA operators fear that high minimum prices could discourage participation from smaller operators. Additionally, many of the FWA operators argue that minimum prices should:

- be lower in towns where NGA is available through fixed lines;
- be lower for operators who indicate an intention to deliver NGA services in rural areas;
- take into account that FWA can only aim to supply businesses or households, rather than individuals (which can be supplied through mobile services); and
- not be based on full coverage of the population in an area as the coverage that could feasibly be achieved in practice is much lower.

Vodafone and Ripplecom also disagree with the comparison of proposed minimum prices to existing FWALA licences.

Response: Level of minimum price

We acknowledge that the benchmarking analysis may need to be updated in light of the latest available data close to the actual award, and that the level of uncertainty around the value of the 3.6GHz spectrum must be assessed as part of that process. We believe it is appropriate that minimum prices be kept under review until the finalisation of the award process. However, equally we note that no compelling evidence has been presented by respondents to suggest that the proposed minimum prices were too high.

The suggestion that minimum prices should be lower for towns where NGA services are already provided would seem to require the need to split out all of these towns into separate regions, which would significantly increase the complexity of the auction. In any case, in relative terms these areas are likely to be those where population density is higher, so there is no reason for setting a lower minimum price.

The minimum prices are being proposed at a conservative level to take account of the uncertainty surrounding the value of the 3.6GHz spectrum and the potential differences in value for different uses; differences in the value of spectrum in rural and the largest urban areas have also been considered. As such, there should be no need to make further reductions in the minimum price for particular sub-areas or for specific users, which may be seen as inconsistent with ComReg's aim for a technology-neutral award and the EC Decision to make this band available for fixed, mobile and nomadic use. For the purposes of designing this award process, it is assumed that the NBP process will address identified market failures.

The benchmarks that we have used are national averages expressing a price/MHz/pop for the entire country. However, this does not mean that there is an implicit assumption that a licensee would cover the whole country. Clearly in our benchmark data, winners of other licence awards will have determined their roll-out plans in the light of their commercial incentives and regulatory obligations; however, this does not require universal coverage and in the benchmarks licensees will be following selective coverage strategies.

Calculating benchmarks on a per capita basis is a standard approach and there is no reason why this should not apply to Ireland. Furthermore, we have tried to take into account value differences across rural and urban areas given the regional structure of the auction. Therefore, there is no further need to account for the fact that licences in Ireland may lead to selective deployment of services and that fixed services will most likely be provided to households rather than individuals.

Response: Comparison with current FWA licences

The previous benchmarking report provided a comparison of existing FWALA licence fees to the proposed minimum prices as a crosscheck. For this purpose, we converted the current localised licences (which have a radius of 20km) to a hypothetical national licence covering the area of Ireland.

Vodafone argues that this comparison is not valid because operators would in practice cherry pick locations with higher population density rather than serve the whole country. Similarly, Ripplecom questions the coverage area calculation and notes that new base stations would be less economical than existing ones.

However, we confirm that the calculation of a hypothetical national licence with existing FWALA fees does *not* feed into the minimum price calculations; it is only intended to provide some context for the proposed minimum prices to assist stakeholders in understanding the proposals. No weight has been put on this calculation for the purposes of determining minimum prices.

3.4 Population adjustments

The MNOs and Imagine disagree with the proposed approach of adjusting minimum prices for rural and urban areas:

- Eircom, and similarly 3IHL, argue that adjusting for commuter flows presumes mobile use, which violates technical neutrality, whereas the spectrum might be used for fixed wireless access by commuters in evenings and at weekends.
- Vodafone argues that adjustments for population flows are overly complex and such value differences should be established in the auction.
- Eircom argues that different prices for urban and rural areas are arbitrary and supports a single price across all regions.
- Imagine does not agree with the proposed structure of the award, which it believes to be mobile-centric.

On the other hand, Rapid Broadband states that minimum prices should reflect lower population densities in some areas and Eurona Ireland Ltd suggests taking into account relative affluence/PPP of regions.

Response

To derive the proposed minimum prices in our previous report, two adjustments were made to take into account urban and rural areas:

- we used regional population figures that take into account commuting flows to give a better indication of the number of people actually present in a given geographical area; and
- we applied the upper point of our proposed range to urban areas and the lower end to rural regions in order to account for reduced costs in urban areas due to higher population density.

The first adjustment has a modest effect in rural areas, lowering prices by at most 9% compared with minimum prices calculated using unadjusted population figures. In urban areas the effect is somewhat stronger, but still moderate, increasing minimum prices by at most 14% compared with prices when using unadjusted population figures.

Rather than adjusting specifically for population densities or relative affluence/purchasing power between different regions (as proposed by Eurona Ltd) our approach consists of simply applying a lower price/MHz/pop to rural areas. Whilst we might ideally like to take account of differing population density, this would be complex and the relationship between population density and likely value is uncertain without making specific assumptions about how spectrum would be deployed. However, this is not relevant if we are only trying to establish a reasonable lower estimate of market value such that the risks of unsold spectrum are not too great. Applying the two adjustments as proposed in our analysis is relatively straightforward as population flows are readily available and the prices simply form the lower and upper end of our proposed price range.

Vodafone argues that if we apply an 'uplift' to urban areas, we should also apply a 'downlift' to rural areas. This is essentially what has been done. First, the commuting flow adjustment maintains the same overall national population, somewhat boosting urban representation but also reducing rural. Second, even though our report does not specifically label the lower price for rural areas a 'downlift', it is still the lower end of our proposed range rather than being a central estimate, whereas the price for urban areas is the upper end of the range. It should be noted that the range itself was already determined conservatively and is being reviewed to take into account any additional uncertainty.

Correcting for commuting flows does not presume mobile – or any other – particular use for the spectrum. This correction is made to better estimate the potential size of user base and addressable market. For example, a commuter might use a mobile connection whilst travelling to work, but then use fixed wireless access for the entire day in the office.

4 Updated recommendations

None of the consultation responses establishes a compelling case that the proposed minimum prices are too high and create a large risk of leaving spectrum unsold. There are sound reasons in line with ComReg's objectives for ensuring that minimum prices are at a reasonable level to discourage strategic behaviour and tacit collusion.

This said, there is a high degree of uncertainty about the benchmark estimates. In the light of the comments received and the need to mitigate the risk of choking off demand, care is required to ensure that this uncertainty is suitably reflected in the proposed minimum prices.

Including more recent awards and updating country-specific data leads to some minor changes in average benchmarks, as reported in

Section 2 above. However, these changes are not material enough by themselves to suggest any need to revise the original recommended minimum prices.

This said, we acknowledge that there are various uncertainties. This includes that some data points are close to the boundaries set by our outlier criteria. Also, some additional points have been raised by respondents, such as the extent to which historic 3.6GHz valuations might have been affected by over-optimism about WiMax and criticism of comparing the spectrum to the more valuable 2.6GHz and 2.3GHz bands. Although none of these arguments are compelling, it may be prudent to ensure that these uncertainties are fully reflected in the proposed minimum prices.

In our previous report, our minimum price recommendation for rural areas (of €0.015/MHz/pop) roughly corresponded to the 3.6GHz price average, whereas the minimum price recommendation for urban areas (of €0.025/MHz/pop) was close to the overall average of all three bands (2.3GHz, 2.6GHz unpaired and 3.6GHz) to reflect the greater range of possible uses and lower roll-out costs.

We now propose to lower the recommended minimum prices somewhat relative to our previous recommendations to reflect uncertainty around the value of 3.6GHz spectrum (in the light of respondents' comments) and the potential sensitivity of the benchmarking results to changes in economic indicators and inclusion of recent awards. Our updated minimum price recommendation for urban areas is now €0.015/MHz/pop, roughly equal to the 3.6GHz price average. This is well below the overall average across all three bands of €0.022/MHz/pop, which we still consider is probably a better indication of likely value of urban spectrum; therefore, at this level the risk of choking off demand should be considered very small.

For consistency, a corresponding reduction should be made to the recommended minimum price for rural areas. The 3.6GHz price average (€0.015/MHz/pop), which may better reflect typical rural deployments, is roughly 70% of the price average across all three bands (€0.022/MHz/pop), which might be a better indicator of urban deployments. On the basis of this relativity, an urban minimum price of €0.015/MHz/pop would suggest a rural minimum price of about €0.010/MHz/pop. Therefore, we recommend the rural minimum price be set at this level.

However, as mentioned before, it is important to set minimum prices high enough to discourage any potential gaming or speculative bidding. On this basis, we consider a minimum price of €0.015/MHz/pop in urban areas and €0.010/MHz/pop in rural areas to be reasonable, but that they should not be lowered any further without reasonable evidence that these minimum prices would risk choking off demand. This would result in minimum prices, upfront and annual fees as shown in Table 5 (assuming a SAF/SUF split of

40/60 as proposed in Section 3.2). Note that the regions have changed slightly relative to our previous report, as they have now been brought in line with the regional split used for the NBP.

Table 5: Proposed revised minimum prices, up-front and annual payments

<i>Region</i>	<i>Adjusted population</i>	<i>Minimum price per MHz per capita (€)</i>	<i>Minimum price for 5MHz (€)</i>	<i>Minimum up-front payment for 5MHz (€)</i>	<i>Constant real annual fee (assuming 1.5% p.a. inflation)</i>
<i>East</i>	632,133	0.010	32,000	12,800	1,984
<i>Border, Midlands & West</i>	1,136,093	0.010	57,000	22,800	3,534
<i>South East</i>	432,824	0.010	22,000	8,800	1,364
<i>South West</i>	711,786	0.010	36,000	14,400	2,232
<i>Dublin CSO city and suburb</i>	1,192,531	0.015	89,000	35,600	5,518
<i>Galway CSO city and suburb</i>	92,623	0.015	7,000	2,800	434
<i>Limerick CSO city and suburb</i>	105,135	0.015	8,000	3,200	496
<i>Cork CSO city and suburb</i>	225,086	0.015	17,000	6,800	1,054
<i>Waterford CSO city and suburb</i>	59,159	0.015	4,000	1,600	248
<i>All regions</i>	4,588,252	0.0118	271,000	108,400	16,802