Commission for
Communications Regulation

# Consultation 15/70 on Proposed 3.6 GHz Band Spectrum Award

## Non-confidential submissions received

Submissions to Consultation Document 15/70

**Reference:** ComReg 15/106R

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# Content

# 1 Airwave Internet

AirWave InterNet
Lackabeha
Carrigtwohill
Co. Cork
Tel: 021 - 4882277

WIRELESS INTERNET SERVICE PROVIDER

www.airwave.ie

26 August 2015

Response to ComReg 15/70 – Consultation on Proposed 3.6Ghz Band Spectrum Award

Mr Joesph Coughlan
Commission for Communication Regulation
Irish Life Centre
Abbey Street
Dublin 1

Dear Mr. Coughlan,

Airwave is an Internet services provider that specializes in providing solutions via a fixed wireless delivery platform. We were founded in 2005 to serve a need for quality broadband connectivity in the Cork area and currently deliver to a mixture of residential and commercial customers throughout approximately half of county cork

We are a member of the ISPAI and its WISP sub-group. We would regard ourselves as a regional WISP serving a local area with a mixture of technologies. Due to our size and the scale of our network, we have not participated in previous spectrum awards. We do not have the resources to provide extensive technical arguments but instead can offer a real world opinion on same.

Auction process

All spectrum is valuable but the 3.6ghz band in particular is ideal for FWA and the delivery of broadband services. It could be argued that ComReg's mandate should prioritize the use of this band to actively deliver broadband services to rural areas – in other words, it is not enough just to generate income from this spectrum – ComReg should see to ensure it is used for broadband.

ComReg could point to poor take-up of existing 3.6ghz licenses, but due to the poor management of same, the uncertainty relating to its future and the relative good performance of unlicensed bands – operators did not see a good business case for investing in 3.6ghz spectrum before now.

The need for increased bandwidth, congestion on unlicensed bands and the forthcoming NBP process mean that the 'game has changed' and ComReg should therefore make every effort to ensure existing operators can build a business case in delivering next generation services in rural Ireland.
This is very much in the national interest.

A significant amount of the spectrum allocation *must* be allocated to FWA operators with of course stringent clauses to ensure the spectrum is used. Large ISP (MNO's) with deep pockets cannot be allowed to purchase spectrum for 'hotspot' type deployments in towns.

Award

The regions as described cut the country into large areas – in our case, the area is Munster. Any existing FWA operator would find it difficult to deploy into the entire area, so a mechanism of sub-letting must be envisioned.

In practical terms, should the spectrum be allocated to one MNO and one FWA (for example) then it may not be possible for a second FWA to purchase a channel. Both FWA operators may not be directly competing due to over lapping or adjacent coverage areas.

Therefore, every effort should be made to ensure a duopoly does not occur and that at least two FWA spectrum awards are made in each area to ensure active and reasonable sub-letting of channels.

In order to ensure that the spectrum is actually used, and to involve the smaller FWA operators, the license holder should be obliged to sub-let channels that are not being used within a reasonable time-frame. The cost of sub-letting must be regulated (based on the initial cost of spectrum) in order to avoid opportunism.
ComReg must involve itself in this process in order to ensure that unused spectrum is sub-let to smaller operators at a reasonable cost

Has ComReg put any thought into how this sub-letting will work ? The license holder will have ultimate responsibility for his spectrum, but disputes will arise if for example technical issues arise ?

License Duration

We would propose an award of no more than 100Mhz per operator with further spectrum available if it can be shown the initial spectrum is used and more is required.

Airwave would consider a 15 year license duration to be short – 20 years would be better. Migration from existing unlicensed networks will take time and it would not be practical (or affordable) to so immediately.
Irrespective of how long the license duration is, ComReg should undertake to ensure a new process is completed 5 years before the end of the current license in order to give clarity and enable operators to make decisions.

Pricing

Our initial reaction to the proposed pricing on a cost per head of population was positive. The lower cost in rural areas acknowledges the higher cost in serving a large rural area with a small population. However, the pricing assumes that the entire area can be covered from a base station and that all within the catchment area can be customers.

Presently, the broadband market is very competitive with several fixed line companies offering fibre based services can deliver very high speeds in built-up areas. Furthermore, recent proposals to grant-aid the extension of these networks into rural areas, mean that the traditional base of FWA operators is being eroded.

Any FWA operator looking to bid for 3.6ghz spectrum must will dismiss towns within the catchment area as being ultra competitive (if not now certainly within the lifetime of the license). Secondly, they will look at the coverage area from their base station and realise that complete coverage of the line-of-sight diameter is not practical.

Therefore, the cost per actual potential customer is much higher than the €0.015 proposed for rural areas.
Furthermore, the applicant is required to pay 50% upfront which is a very large capex investment for any company. In fact, it is likely to be impossible for any company to fund this without seeking external investment.

A 25/75 split would encourage smaller FWA operators to get involve in the process.

Regards,

John Barry

**----------**
**John Barry**
**Airwave Internet**

**www.airwave.ie**

**p: 021-4882277**
**m: 087 - 9471657**
**e: john@airwave.ie**

# 2 Aptus Ltd

28th August 2015

Mr Joseph Coughlan
Commission for Communications Regulation
Irish Life Centre
Abbey Street
Freepost
Dublin 1

Email marketframeworkconsult@comreg.ie

**Re Submissions to ComReg 15/70: – Aptus Ltd**

Dear Mr Coughlan,

Aptus Ltd would like to make the following reply in terms of consultation ComReg15/70

**Chapter 2 Background**

Aptus Ltd agrees with the point **2.20** *"The FWALA licensing framework has helped facilitate the provision of wireless broadband (WBB) services across Ireland and has been particularly beneficial for the provision of these services in small towns and rural areas."* But disagrees with point **2.25** that the *"FWALA services reached their peak subscriber numbers of circa 121,000 in 2008 and have been declining steadily since. The reduction in subscriber numbers may be due to increased competition from mobile broadband services and an increase in the availability of fixed line broadband, particularly in rural areas."* Aptus disagrees that the drop in FWALA subscribers to 27,302 today from it height of 121,000 subscribers is totally due to the reasons outlined above,(1) competition from mobile broadband and (2) an increase in the availability for fixed line broadband Aptus ltd believe that had circumstances been different then the figures for FWALA subscribers today would be significantly higher that 27,302. From a recent survey carried out by the ISPAI of its wireless ISP members it was indicated that from the 34 companies who replied to the survey that cira 74,000 customer were services by fixed wireless technology but it should be noted that there are in excess of 60 wireless ISPs currently operating in Ireland (not all of which are members of the ISPAI) and we believe that from extrapolation that it would be fair to say that there are well in excess of 100,000 customers receiving broadband services via fixed wireless technology from wireless ISP's today. Aptus ltd believe that should the situation have been difference in relation to the uncertainty in the 3.6Ghz spectrum between 2010 and today then a significantly larger proportion of the circa 100,000 fixed wireless broadband customers would be serviced using 3.6Ghz technology. While Aptus ltd cannot speak for other wireless ISPs from its own prospective it would certainly have had a large proportion of its network service on the 3.6Ghz ban should that have been more certainty around the 3.6Ghz spectrum. It is also important to note that the majority of these circa 100,000 fixed wireless customers are based in rural areas and small towns were very often both mobile broadband and fixed line broadband solutions are poor or non-existent

**Chapter 3 The Draft Regulator Impact Assessment**

Aptus Ltd agrees with the preliminary view of Comreg that the 3.6Ghz bands should be assigned by way of auction with no other bands included in the auction.

Aptus Ltd is of the opinion that due consideration should be giving to the terms of the auction and the allocation of spectrum so as not to disadvantage rural areas. It is the belief of Aptus ltd that the interest of the state are best service by ensuring that spectrum is made available to rural areas and that condition are applied where possible to ensure that rural areas of Ireland are services by this spectrum. Aptus ltd believe the 3.6Ghz spectrum is an ideal spectrum for the delivery of high speed high capacity fixed wireless broadband to rural areas but at the same time it would be much more profitable for the winning bidder for the spectrum if they were to use the spectrum for the deployment of the infrastructure in more densely populated areas and ignore the needs of rural communities. The DCENR is currently working on its NBP to ensure the delivery of NGA broadband across Ireland. Aptus ltd believe that if 3.6Ghz Spectrum can be made available at a reasonable price with specific condition to ensure available of the spectrum for use in rural areas then it would encourage investment by the private sector in NGA broadband infrastructure for rural areas and significantly reduce the sum of money required to be spend by the government in it broadband intervention program (NBP).

Urban and densely populate areas currently have and will always have many differ options to high speed , high capacity broadband and therefore Aptus Ltd believer that they should not be excluded from access to the 3.6Ghz spectrum but their access to 3.6Ghz spectrum should be worked around access given to the rural areas who may have no other option for broadband.

**Chapter 4 Key Aspects of the Proposed Award Spectrum**

Aptus ltd agrees that the band plan for 3400 – 3600 Mhz sub-band should be TDD. There are many advantage to TDD and with synchronisation great frequency efficiencies can be achieved.

Aptus ltd agrees with the regions identified in option 2 should be used for the award process

Aptus ltd agrees with a long license duration but feel that in light of the fact that the DCENR are running the NBP over a 20 year period that it would be more appropriate to align the duration of the 3.6Ghz spectrum license with the 20 year NBP of the government.

**Aptus Ltd**
Lorum Hs, Bagenalstown Co Carlow
Tel +353 91 58030
Email: info@aptus.ie

**Chapter 5 Award Type and Format**

Aptus Ltd agrees that a single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz

Aptus Ltd agrees that Sixty five (65) frequency-generic lots of 5 MHz each should be adopted for frequencies between 3475 MHz – 3800 MHz

Aptus Ltd agrees that a competition cap should be set, while Aptus Ltd will not comment on the cap for urban areas it believe that for the 4 regions the cap should be in the region of 100Mhz. Aptus Ltd believe that with synchronization and efficient use of spectrum and proper planning that 100Mhz will facilitate the delivery high speed and high capacity broadband to rural areas. Which at the same time ensuring that a minimum of 3-4 operators will have access to spectrum? With 3-4 operator in a region it will encourage competitor, put upward pressure on the package offered by those operators and give opportunity for greater coverage for rural areas.

Aptus Ltd believes that the minimum price should be set and while Aptus Ltd will not comment on the minimum price for urban areas it believe that a price between €0.015 and €0.025 per Mhz per capita in too high for two reason

1. For the delivery of broadband via fixed wireless technology using the 3.6Ghz spectrum in rural areas the areas with pockets of dense populations (towns) will already have access to broadband via FTTX and for that reason will not be a target customer of the winning bidder.
2. For the delivery of broadband via fixed wireless technology using the 3.6Ghz spectrum a customer will typically be either a home or business and if we are to take the example of a home then we are looking at approx. 2.5 persons per home ie 1 subscription /2.5 persons instead of 1 subscription / person that you might achieve with a mobile service.

Aptus Ltd feel the a splint of 50/50 between SAF and SUF is a little high for the SAF component and fell that a 25/75 SAF / SUF splint would be a better options and give smaller Wireless ISPs a better chance to compete in the auction for spectrum, who are essentially the operators who are currently providing services to broadband users in rural Ireland.

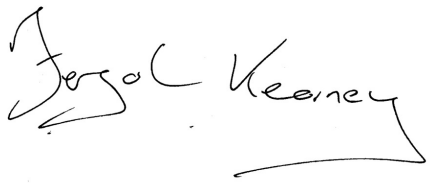
**Aptus Ltd**
Lorum Hs, Bagenalstown Co Carlow
Tel +353 91 58030
Email: info@aptus.ie

Chapter 6 Licence Conditions

Aptus Ltd believe that a default TDD frame Structure based on TD-LTE configuration 2 (3:1) should not be applied to incentivise internet synchronisation. Aptus believe that Synchronization should be encouraged but that are other synchronization solutions in the market place that operate equally if not more effective as TD-LTE and therefore should enough operators subscribe to a different synchronisation solution then that should be acceptable also. One example of this is Cambium Networks PMP450

Yours sincerely,

Fergal Kearney
Aptus Ltd



**Aptus Ltd**
Lorum Hs, Bagenalstown Co Carlow
Tel +353 91 58030
Email: info@aptus.ie

# 3 BBnet

EOBO Limited, t/a BBnet,
Ballingarry Road,
Adare
Co Limerick

27 Aug 2015

Mr. Joseph Coughlan
Commission for Communications Regulation
Irish Life Centre
Abbey Street
Dublin 1

## Submission on Comreg 15/70 from BBnet.

BBnet is an authorized provider of telecommunications services, employing 10 people. BBnet provide services to approximately 3,000 customers. We have been providing broadband services (primarily) in rural Munster for 10 years. We have previously enquired about acquiring 3.6ghz spectrum, but decided against it on grounds of questionable ROI, given the licence expiry deadline of July 2017. Our inputs on Comreg 15/70, are summarized below:

As a regional ISP, we do not have any experience of the auction process being described in the document. Accordingly, we do not feel qualified to comment on the merits, or otherwise of such a process – other than to say an auction process will inevitably favour larger operator with bigger budgets, who can afford to sit on the licences and only roll out limited services (at best). In the interests of fairness to all operators, rigorous steps need to be taken to ensure that this cannot happen.

**Section 3: Draft Regulatory Impact Assessment (RIA)**
*"ComReg is of the preliminary view that the 3.6 GHz band should be assigned by way of auction with no other bands included in the auction".*

There are a number of reasons why we propose that a *portion* of the spectrum in rural areas should be designated as primarily for FWA where operators have expressed an interest in rollout of NGA equipment.

1. The relatively large amount of available spectrum.

2. The national interest to deliver NGA broadband to as many rural premises as possible in the shortest timeframe and the lowest impact to the taxpayer.

3. The history of service provision by FWA providers. We contend that had it not been for ComReg decision 10/29 or had ComReg provided a much earlier consultation on the 3.6Ghz spectrum then there would have been significantly greater investment in licensed FWA with significantly more competition and subscribers connected in rural areas. By ensuring adequate spectrum is made available (at a reasonable price) in large areas ComReg can encourage investment in the sector which may significantly reduce the dependence on state subsidy in the NBP.

In the opinion of BBnet, it is inappropriate to award a significant amount of spectrum via an auction process to authorized operators for use solely as capacity spectrum in hotspots in the larger towns within the rural regions. These towns will soon be well served by fixed line services from Eircom and SIRO. Due consideration must be given to the national interest in delivering NGA access to as many rural locations as possible with the least impact to the taxpayer. Requirements for in-building capacity spectrum by MNOs could and should be met through an obligatory system of sub-leasing of spectrum for these purposes. We extend this point to highlight that it should not be permitted to acquire spectrum on the basis of the *potential* for future use and that any award should be based on presentation of clear evidence of concrete rollout plans. In meeting its statutory obligations, Comreg must ensure that these plans are real and substantiated.

## Section 4: Key aspects of the Proposed Award Spectrum.

*The band plan will be TDD, 1x 25MHz slot and 65x 5MHz slots.*
*Regions will be established in line with the principles established by ComReg. (Option. 2)*
*A license duration of 15 years should apply to the 3.6GHz band.*

BBnet support the option 2 boundaries. But, we believe that it is imperative that an efficient process for spectrum trading be created alongside this process. There are many well established smaller/medium size WISP's, who are interested in using 3.6ghz to deliver NGA services, especially in rural areas. In practical terms, spectrum trading is the only way in which this can happen. The pricing model for such trading needs to be clearly set out and transparent.

BBnet believe that the license duration should be 20 years, to bring it into line with the proposed NBP award and to give greater investment certainty to operators.

### Section 5: Award Type and Format

*A cap of 150-250Mhz per operator should apply*
*The minimum price should be apportioned on a 50/50 basis (SAF and SUF).*
*Minimum price range of between €0.015 and €0.025 per MHZ per capita.*

BBnet strongly support the following ComReg proposals:
1. That the 3.6Ghz band is assigned with no other bands included in the process.
2. That the region model (option 2) proposed by ComReg is appropriate.

3. That a cap should apply. We recommend a cap of 100Mhz in an initial phase (perhaps 2 years) with opportunities to acquire additional spectrum provided defined criteria (to be developed) are met. We propose that these should include at least the number of subscribers connected in a given license region.
5. That rollout obligations should apply to successful bidders and failure to comply within specified timeframes should result in loss of access rights to spectrum.

**Minimum Pricing.**

The economies involved in fixed wireless networks are significantly different from those of MNOs as is clearly understood by ComReg. ComReg appear to acknowledge this in the proposed pricing model where a minimum price of €0.015 is proposed for rural regions vs. €0.025 for urban. However this does not go far enough. Given the national interest, it would seem appropriate that a much reduced SAF (up-front payment) should apply to operators who indicate an intension to deliver NGA services in rural areas. ComReg can easily ensure the legitimacy of such operators by specifying rollout obligations.
Setting the minimum price of a region based on an assumption of full coverage of the population within that region is false. The population covered is more accurately determined by an analysis of coverage from known mast sites.

In deriving the minimum price, the population numbers that may be potential customers for FWA in rural areas should exclude the population of larger towns where there is access to fibre or cable technologies or where access to fibre is planned to be available in the near term. Indeed given the recent announcement by Eircom and the proposals of the NBP the subscriber base that may be connected by NGA FWA is likely to reduce significantly between now and 2020. All of this would greatly reduce the population number used to determine the minimum price point.

Finally, we contend that rather than a 50/50 split of the SAF vs. SUF that a 25/75 split would encourage more participation by existing smaller companies and new entrants. The price at which 3.6ghz licences will be acquired at, will greatly affect the price at which NGA services can be delivered at. To ensure competitively priced and affordable FWA services, and to promote competition (a comreg statutory obligation) especially in rural areas, it is imperative that SAF & SUF payments are kept to a minimum.

Yours Sincerely,

*B O'Halloran*

_____
Barry O'Halloran.
Managing Director.

# 4 Carnsore Broadband

carnsorebroadband
Fibre Powered Broadband for Wexford

**Response from Carnsore Broadband regarding the Submissions to ComReg 15/70**

**Dated 27 August 2015**

For the attention of Mr. Joseph Coughlan Commission for Communications Regulation Irish Life Centre Abbey Street Freepost Dublin 1 Ireland Email: marketframeworkconsult@comreg.ie

## The following are the main points of concern:

- **Section 3: Draft Regulatory Impact Assessment (RIA)**

We propose that a portion of the spectrum in rural areas should be designated as primarily for FWA operators for the following reasons:

1—There is a relatively large amount of spectrum available which would enable FWA operators to deliver NGA broadband services as specified by the National Broadband Plan .

2---If Comreg make available adequate spectrum to FWA operators at a low or no cost Comreg can encourage investment for the sector to deliver NGA .This in turn would reduce the dependency on state subsidised NBP rollout.

- **Section 5: Award type and format**

We agree with the ComReg proposal that a long term licence is appropriate however perhaps a minimum of 20 years would be better. This licence should be reviewed well in advance of the end of the licencing period and the 3.6Ghz band should be assigned separately from the other bands.

- **Minimum Pricing**

We feel that a low cost or no cost solution should be made available for FWA operators to allow NGA services to be provided by them. FWA operators have been supplying broadband to rural communities for the past 10 years, and it would be inappropriate and also not in the national interest for larger operators to be given a competitive advantage over smaller ISP's.

The pricing guidelines set out by ComReg do not take into account that in the future (as defined by the NBP) a large number of households / businesses will be able access high speed broadband by fibre or cable technologies. This would reduce the number of subscribers to wireless services, and the minimum pricing should reflect this.

# 5 Digital forge

# Annex 7: Consultation Questions

## General submission concern

Just to make Comreg aware that Digitalforge does not have a large department dedicated to responding to Comreg's detailed consultation papers. We are disadvantaged by not having had experience of previous auction processes nor access to technical expertise in assessing the relative merits, advantages and disadvantages of the alternative auction processes outlined. ComReg should bear this in mind when weighing up the responses received and deciding on the options available to it in the final design of the allocation process and in designing the rules that should apply.

## A7.1 Chapter 4 Consultation Questions

Do you agree with ComReg's preliminary views set out in Chapter 4 and in particular, that

The band plan for the 3 400-3 600 MHz sub-band should be TDD (in line with the preference expressed in the 3.6 GHz EC Decision)

Digitalforge agree with Comreg in that the 3.6 MHz band should be TDD

Regions should be established in line with the principles identified by ComReg;

I disagree, we are a small fixed Wireless operator based in County Cork and the region's proposed and in turn the pricing structure put us out of contention to obtain the licenses dues to cost. This can either be rectified by reducing the licence fees or make the regions smaller.

The regions identified in Option 2 should be used for the proposed award;

disagree

A licence duration of 15 years should apply to the 3.6 GHz band.

Disagree, I would prefer a duration of 20 years in order to have security of my investment and ensuring that the customers have security of service. A consultation on existing 3.6GHz licenses at least 5 years before the termination date of such licenses should be performed so that operators can make appropriate business decisions and preparations for any potential changes

## A7.2 Chapter 5 Consultation Questions

Do you agree with ComReg's preliminary views set out in Chapter 5 and, in particular, that:

• A combinatorial clock auction is the preferred auction format;

It is in our opinion inappropriate to award a significant amount of spectrum via an auction process to MNOs for use solely as capacity spectrum in hotspots in the larger towns within the rural regions. Due consideration must be given to the national interest in delivering NGA access to as many rural locations as possible with the least impact to the taxpayer. Requirements for in-building capacity spectrum by MNOs could and should be met through an obligatory system of sub-leasing of spectrum for these purposes. We extend this point to highlight that it should not be permitted to acquire spectrum on the basis of the *potential* for future use and that any award should be based on

presentation of clear evidence of concrete rollout plans. In meeting its statutory obligations Comreg must ensure that these plans are real and substantiated.

• A single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz;

Agree

• A competition cap should be set and, further, that such a cap be within the range of 150 MHz to 250 MHz. Comreg is mindful of the alternative uses to which this spectrum can be put and the potential impacts this can have on competitive dynamics in the relevant market concerned (for example fixed of mobile). Accordingly, Comreg welcomes input on any other factors which should be taken into account when establishing the level of any competition cap;

To ensure adequate competition and to curtail spectrum hoarding, a spectrum limit of 100MHz per operator per region for an initial period should be adopted. Rollout conditions may be specified such that if operators fail to meet required targets (as reported to ComReg) that they may lose their entitlement to some of all of the awarded spectrum

Benchmarking be used as the approach by which to determine a conservative minimum price;

• the minimum price should be apportioned on a 50/50 basis between an up-front payment (SAF) and ongoing annual payments subject to CPI index linking (SUFs);

We contend that rather than a 50/50 split of the SAF vs. SUF that a 25/75 split would encourage more participation by existing smaller companies and new entrants.

• the range €0.015 to €0.025 per MHz per capita is appropriate for the setting of the minimum price, with the higher end of the range applying to urban areas and the lower end applying to regions that do not have specific urban areas identified.

The economies involved in fixed wireless networks are significantly different from those of MNOs as is clearly understood by ComReg. ComReg acknowledges this in the proposed pricing model where a minimum price of €0.015 is proposed for rural regions vs. €0.025 for urban. However this does not go far enough. Given the national interest, it would seem appropriate that a much reduced SAF (up-front payment) should apply to operators who indicate an intension to deliver NGA services in rural areas. ComReg can easily ensure the legitimacy of such operators by specifying rollout obligations.

Setting the minimum price of a region based on an assumption of full coverage of the population within that region is false. The population covered is more accurately determined by an analysis of coverage from known mast sites.

ComReg report that there are 120-170 BS currently in the rural regions, each with an FWALA service area of 314km$^2$. This gives a total coverage area of approx. 45,000 km$^2$. However many of these BS are in close proximity to each other so the real coverage is likely less than 30,000km$^2$, less than 40% of the area of the country. Although it may be possible to develop new high sites these are likely to be of lesser economic value in connecting additional subscribers. In addition, although the population density is likely greater in the existing FWALA coverage areas, due to the LOS nature of 3.6Ghz it is also clear that fixed wireless can connect to significantly less than 100% of premises in these coverage areas.

In deriving the minimum price, the population numbers that may be potential customers for FWA in rural areas should exclude the population of larger towns where there is access to fibre or cable

technologies or where access to fibre is planned to be available in the near term. Indeed given the recent announcement by Eircom and the proposals of the NBP the subscriber base that may be connected by NGA FWA is likely to reduce significantly between now and 2020. All of this would greatly reduce the population number used to determine the minimum price point.

## Chapter 6 Consultation Questions

Do you agree with ComReg's preliminary views set out in Chapter 6 and, in particular, that:

• The band should be released on a service- and technology-neutral basis;

Agree

• Rights of use in the band should be awarded on a non-exclusive basis;

• An obligation to notify of the termination of a technology should apply;

Agree

• a rollout obligation should apply for spectrum rights of use in this band and that such an obligation should be based on a minimum number of base stations to be deployed per sub-national region;

Agree

• a quality of service obligation should apply in relation to each of network availability and voice call standards;

Agree

# 6 Eircom/Meteor

**eircom Group**

# Response to ComReg Consultation Paper:

# Consultation on Proposed 3.6 GHz Band Spectrum Award

**ComReg Document 15/70**

**28 August 2015**

## DOCUMENT CONTROL

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The comments submitted to this consultation are those of Meteor Mobile Communications Ltd. (MMC) and eircom Ltd (eircom) collectively referred to as eircom Group.

**Responses to Consultation**

eircom welcomes the opportunity to contribute to ComReg's proposals for the award of the 3.6 GHz band. We generally agree with ComReg that it is appropriate to proceed with an award solely focussed on the 3.6 GHz band. This strikes the right balance between developing national policy in respect of the 700 MHz band and release of the 3.6 GHz band where there is already established demand and which is likely to be of significant interest to mobile and fixed operators for the provision of wireless broadband services.

***Do you agree with ComReg's preliminary views set out in Chapter 4 and, in particular, that:***

- ***the band plan for the 3 400-3 600 MHz sub-band should be TDD (in line with the preference expressed in the 3.6 GHz EC Decision);***

eircom agrees that the band plan should align with the EC Decision. This will ensure that users in the band in Ireland will benefit from a rich equipment ecosystem that we expect will evolve from the widespread exploitation of this spectrum on a harmonised basis.

We note that part of the band 3 435 – 3 475 MHz is currently in use for unspecified State services and that ComReg is in ongoing discussions with the relevant State body. We believe it would be beneficial if all of the band could be made available without restriction. eircom requests that ComReg undertakes analysis that identifies the cost / benefit of the continued State use of this spectrum and that the outcome of this analysis be published alongside ComReg's final decision regarding this spectrum.

If State services are to continue to be used then we would agree that the spectrum below the frequency of the State services should be released as a single 25 MHz block. eircom welcomes ComReg's commitment[1] to further clarify whether the existence of the State services may impact on the right of adjacent users to use spectrum won in the award process.

- ***regions should be established in line with the principles identified by ComReg;***

ComReg proposes five principles[2]:

"*1. There should a small number of regions (i.e. between circa five to nine regions) including the major cities to provide a balance between allowing bidders flexibility to obtain spectrum licences in an appropriately-sized area and limiting auction complexity.*

*2. Use established boundaries for the identification of borders between regions e.g. County boundaries and/or County council boundaries.*

*3. Minimise the instances of tri-lateral agreements occurring between operators at boundaries between regions.*

*4. Eliminate, as far as practicable, the instances where a city region is adjacent to two other regions.*

*5. By extension, facilitate the potential for each regional operator to acquire both a city and surrounding rural region.*"

[1] As expressed in Footnote 49, page 63 of ComReg 15/70
[2] Paragraph 4.92, ComReg 15/70

eircom has considered ComReg's proposed principles and agrees that they are fit for purpose. In particular we agree with ComReg[3] that "*In considering the number of regional areas to be awarded … there is a balance to be struck between allowing bidders flexibility to obtain spectrum licences in an appropriately sized geographic area, and the complexity of the auction mechanism*." This is captured in principle 1 and we also agree that the number of and the design of regions should be such to minimise the complexity of coordination between users at the borders. The inclusion of cities separately recognises that use in cities may differ from use in other areas.

- ***the regions identified in Option 2 should be used for the proposed award; and***

eircom considers that Option 2 is preferable to Option 1. eircom fully agrees that there should be five urban regions and four rural regions. In principle we have no objections to the definition of each of these regions in terms of areas covered.

- ***a licence duration of 15 years should apply to the 3.6 GHz band.***

eircom's position on licence duration remains as set out in section 7 of our response to ComReg 14/101 that indefinite licences are optimal to encourage continual investment. As noted in that response even if finite licences are adopted there are practical considerations that must be considered when setting finite licence durations: "*A minimum term of 15 years, assuming commencement date of April 2016, would mean that the licences could become available in 2031. This would be too close to the spectrum awarded in 2012 and could prove to be very disruptive. Taking into account the need to allow a sufficient period for return on investment we believe the minimum term should be set at 20 years*." eircom is therefore disappointed that ComReg is proposing the licence duration should be 15 years.

ComReg seeks to justify its position with two observations at paragraph 4.145 of the consultation document. ComReg's first observation notes that "*an asset life of 8 years is used for the vast majority of the mobile elements. … ComReg observes that this asset life may be equally applicable to future fixed deployments in the band. Accordingly, a 15 year duration would allow potential licensees a generously sufficient period of time to obtain a return on its investment considering this asset life.*" It is not clear to us how an asset life of 8 years in any way supports ComReg's proposal for a 15 year licence duration. The physical life of an asset is not the important determinant even if the period ComReg suggests is correct, which we submit it is not, it is the period over which the investment in the asset is recovered economically. If we assume that the physical life and the investment recovery period are aligned at 8 years then it would be clear that a rationale investor would cease to invest in new equipment after year 7 of the licence.

ComReg's second observation is equally concerning. "*The on-going developments in the 3.6 GHz band that could over time change the attractiveness of this band to certain services and the demand for spectrum in this band. This may mean that the primary spectrum outcomes derived from this award process may not be the most optimal outcomes in the future. While market mechanisms, such as spectrum transfers and leasing, have the potential to address any such concerns, ComReg observes that a duration towards the lower end of the 15 to 20 year range would further mitigate the risk of sub-optimal outcomes in the longer term*." In effect ComReg is saying that it has no faith in market mechanisms to determine the efficient use of spectrum. This of itself is not justification for a finite licence duration and certainly not a proposal for a duration of 15 years. eircom has previously proposed indefinite licence durations with the potential for licences to be revoked. As noted

[3] Paragraph 4.68, ComReg 15/70

in our response to ComReg 14/101, "*Licences could be revoked by ComReg after the minimum term, subject to a reasonable notice period, to align with significant developments that may justify making the spectrum available to the market*." We remain of the view that ComReg has not presented sufficient justification for its licence duration proposal of 15 years. ComReg has maintained an entirely arbitrary approach to licence duration which contradicts ComReg's own reasoning. ComReg's observations regarding asset lives and uncertainty regarding future use of the band in fact point towards a requirement for a shorter licence duration in respect of the 3.6 GHz band. If ComReg is to be consistent with its own reasoning then the duration of 3.6GHz licences should be in the region of 7 to 10 years.

***Do you agree with ComReg's preliminary views set out in Chapter 5 and, in particular, that:***

- ***a combinatorial clock auction is the preferred auction format;***

eircom agrees that a combinatorial clock auction is the preferred auction format for the reasons outlined in the consultation document.

- ***a single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz;***

As noted above if State services are to continue to be used then we would agree that the spectrum below the frequency of the State services should be released as a single 25 MHz block.

- ***Sixty five (65) frequency-generic lots of 5 MHz each should be adopted for frequencies between 3475 MHz – 3800 MHz;***

eircom agrees that frequency generic lots of 5 MHz may be appropriate as this is the minimum size of the building blocks for service delivery. However it is unlikely that a service could be meaningful delivered on less than 20MHz. The complexity of the award process can be simplified somewhat if the number of lots is reduced. Consequently we believe there is merit in consideration being given to lot sizes of 20 MHz for the frequency generic lots.

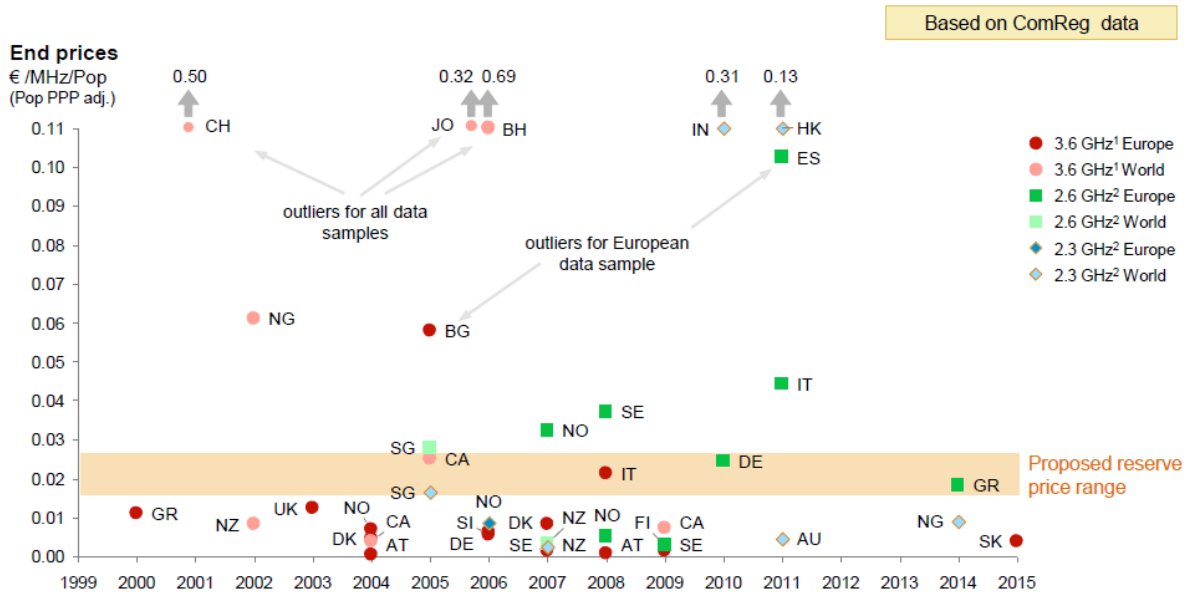
- ***a competition cap should be set and, further, that such a cap be within the range of 150 MHz to 250 MHz. ComReg is mindful of the alternative uses to which this spectrum can be put and the potential impacts this can have on competitive dynamics in the relevant market concerned (for example fixed of mobile). Accordingly, ComReg welcomes input on any other factors which should be taken into account when establishing the level of any competition cap;***

eircom notes the analysis set out in the consultation document that the competition cap should be set in the range of 150 MHz to 250 MHz. In our view a cap in the region of 250 MHz is too loose. This could lead to an extremely asymmetric outcome with two parties able to acquire all of the spectrum to the detriment of promoting a competitive playing field with a reasonable number of capable players. Competition between the two parties would also be distorted if one entity acquired spectrum to the cap of 250MHz leaving 100MHz for the other party. This asymmetry would give substantial advantages to the operator with the significantly larger assignment that cannot be replicated in terms of quality of service offered and cost of network rollout. . In our view the cap is better set in the range of 150 MHz to 200 MHz.

- ***benchmarking be used as the approach by which to determine a conservative minimum price;***
- ***the minimum price should be apportioned on a 50/50 basis between an up-front payment (SAF) and ongoing annual payments subject to CPI index linking (SUFs); and***
- ***the range €0.015 to €0.025 per MHz per capita is appropriate for the setting of the minimum price, with the higher end of the range applying to urban areas and the lower end applying to regions that do not have specific urban areas identified.***
- ***the population of each of the regions under Option 2 should be adjusted to take account of the commuter flows between the five identified cities and the other applicable regions.***

eircom will address all the questions regarding spectrum pricing together. As noted in the consultation document there are a number of approaches that can be used to inform the setting of minimum prices. eircom acknowledges that benchmarking can be used as one such approach. We also agree with ComReg's stated intent that the minimum price should be established on a conservative basis. However there are a number of reasons why we do not believe that ComReg's proposals are conservative or equitable and as such ComReg's proposals risk distorting the efficiency of the award process.

The data presented by ComReg seems inappropriate to estimate the market value for 3.6 GHz licences in Ireland. The 3.6 GHz data is mostly very old and the 2.6GHz data is not comparable because the band has much better propagation characteristics and a wider application range, as well as a much larger equipment ecosystem. It should also be noted that non-European data is not comparable because the spectrum situation in these countries is often very different from Europe (higher scarcity). Even if one accepts the data points chosen by ComReg, the approach to calculating an average appears to be skewed upwards.




This calls into question the range of €0.015 to €0.025 proposed by ComReg. We do not consider these to be conservative estimates.

ComReg proposes to use the lower end of the range to calculate prices for the rural regions and the upper end of the range to calculate prices for the urban regions. In eircom's view this is done in an entirely arbitrary way which is indeed reflected in the way ComReg

describes its proposal[4] "*Dotecon observes that there are no simple means to relate population density to unit costs and hence to spectrum valuations. This is made more difficult because this population cost relationship is likely to vary across different operators and uses. However, DotEcon adjust for this effect by using a higher price per MHz per capita, within the conservative range, when calculating the minimum price for regions with a high population density*." eircom believes that a single price per MHz per capita should be used. This reflects the greater current demand for this spectrum outside urban areas.

eircom also questions the justification for adjusting the regional population figures for commuting patterns. A population adjustment of this nature is questionable in any event as such patterns change (indeed this is one of the likely effects of the NBP) however what ComReg is proposing in the context of the 3.6 GHz spectrum appears to us to run against the principle of technology and service neutrality. In effect ComReg is making an adjustment assuming that the spectrum will be used for mobile purposes. However the 3.6 GHz spectrum can be used for fixed and mobile uses and ComReg's adjustment has the potential effect of creating a higher price per MHz per capita capable of being served by fixed services. The proposal to adjust for commuter flows should be dropped.

**Do you agree with ComReg's preliminary views set out in Chapter 6 and, in particular, that:**

- ***the band should be released on a service- and technology-neutral basis;***
- ***rights of use in the band should be awarded on a non-exclusive basis;***

eircom agrees.

- ***an obligation to notify of the termination of a technology should apply;***

eircom has no objection to such an obligation on the understanding that the obligation will be "*substantively the same terms as that imposed on Liberalised Use Licences issued under S.I 251 of 2012*"[5].

- ***a rollout obligation should apply for spectrum rights of use in this band and that such an obligation should be based on a minimum number of base stations to be deployed per sub-national region;***

eircom agrees that it is appropriate to define rollout obligations in terms of minimum coverage requirements to encourage the efficient use of the spectrum. ComReg proposes to define the rollout obligation in terms of the number of transmitters in each region. This is a novel approach moving away from the established form of coverage obligations expressed in terms of population to be covered. ComReg proposes to express the coverage obligation by reference to existing use of the spectrum by FWA operators with between 15-25 network controlled sites in at least 3 to 5 Counties of rural regions, 15-25 sites in Dublin, and 2-4 sites in the other urban regions. It is not clear to us that one size of coverage obligation will be appropriate for all users and to guard against the risk of hoarding. In particular, if ComReg sets the spectrum cap in the region of 200 to 250 MHz this is a substantial quantity of spectrum and it may be appropriate to express a more substantial rollout obligation to guard against hoarding of the spectrum. As such eircom believes that a sliding scale coverage obligation should be established such that the number of sites proposed by ComReg applies for spectrum holdings of 100 MHz or less. The scale should then move up

[4] Paragraph 5.139, ComReg 15/70
[5] Paragraph 6.22, ComReg 15/70

proportionally such that the number of sites required for the largest holdings (e.g. in the region of 200 to 250 MHz) is set at four times the basic level. eircom's proposed approach is consistent with ComReg's proposals in respect of specifying minimum base station requirements by reference to the size of the spectrum holding.

eircom agrees with ComReg's view that a rollout period between 3 to 5 years is appropriate. We also agree that the coverage obligation of a national or multi-region licence should be expressed as the aggregate of the relevant regional licences.

- ***a quality of service obligation should apply in relation to each of network availability and voice call standards;***
- ***licensees should internalise guard-bands as spectrum should be assigned without guard-bands; a default TDD frame-structure based on TD-LTE configuration 2 (3:1) should be applied to incentivise inter-network synchronisation;***
- ***a permissive BEM should apply to synchronised networks and a restrictive BEM should apply to unsynchronised networks;***
- ***the terminal station in block power limit set out in the 3.6 GHz EC Decision should be relaxed for fixed outdoor installations;***
- ***at regional borders a coordination threshold should apply to allow for bilateral/multilateral co-existence agreements; and***
- ***where agreement in cross-border coordination fails to be met, the coordination threshold limit should be set as a binding licence condition***.

eircom agrees with the technical proposals.

***Do you agree with ComReg's preliminary views set out in Chapter 7 and, in particular, with the following proposals:***

- ***Transition Proposal 1: the formulation of a transition plan for the 3.6 GHz band***;

ComReg's proposals in respect of the principles to underpin the formulation of a transition plan are in line with those previously applied for the MBSA in 2012. eircom was a participant in the MBSA transition plan for timeslice 1 and timeslice 2 and notes that both transition phases completed satisfactorily. As such we can see no reason why the principles should not be appropriate for any transition activities arising from the 3.6 GHz award process.

We note ComReg's comments regarding the potential for market forces to assist in resolving transitional issues and look forward to ComReg's proposals in respect of establishing a framework for spectrum leasing. We believe that a spectrum leasing framework should be designed to encourage market led solutions and as noted by ComReg such features could include allowing the use of leased spectrum to count towards the lessor's coverage for the purpose of assessing compliance with coverage obligations.

- ***Transition Proposal 2: the Transition Protected Licence; and***

ComReg proposes to allow the issuance of Transition Protected Licences to existing licensees, if necessary, to allow completion of transition activities beyond the expiry date of the existing licences. At this stage we cannot predict how complex the transition arrangements will be. There may be a requirement for a number of licensees to undertake sequential works to facilitate a transition. If the transition arrangements are complex it may be necessary for the activity to run beyond the expiry dates of the existing licences. As such

we agree with ComReg's proposal to facilitate the process allowing for Transition Protected Licences. Clearly it will be necessary to ensure that the duration of such licences is the minimum necessary period reasonably required to undertake and complete transition activities. ComReg proposes that the terms and conditions of the Transition Protected Licences should be the same as existing licences with the exception of the duration and potentially amendment to frequency assignments. In eircom's view consideration should also be given to amending the licence fees. Increased licence fees would incentivise the timely completion of the transition activities.

- ***Transition Proposal 3: the Transition Unprotected Licence.***

ComReg proposes to introduce Transition Unprotected Licences which would allow any existing licensee who fails to acquire sufficient rights in the 3.6 GHz award process, to continue to provide service to end users until such time as an alternative means of supply has been established. Alternative means of supply could be from a successful 3.6 GHz operator or an alternative technology, such as fibre, delivering fixed broadband to the area. eircom agrees there is merit in such licences to maximise the benefits to end users.

eircom agrees with ComReg[6] "*that any regulatory mechanism proposed must not provide perverse incentives for the Existing Licensees in terms of the nature and extent of their participation in the proposed award or in terms of coming to a market-based resolution of the transition scenario identified*." eircom supports the concept of Transition Unprotected Licences provided the following fundamental principles are maintained:

- Transition Unprotected Licences may only be applied for by existing licensees who have participated in the 3.6 GHz award process and failed to acquire sufficient spectrum to maintain an existing fixed wireless broadband service.
- The existing licensee is the sole provider of fixed broadband services in the area. If there are one or more alternative suppliers in the area then we do not believe there is a basis to justify the issuance of a Transition Unprotected Licence.
- The licences should be of a reasonably short duration and in this regard we agree with ComReg that a maximum term in the region of 2 to 5 years is appropriate.
- The licences should be terminated rapidly following deployment of alternative means of supply of fixed broadband to the area from a successful 3.6 GHz operator or an alternative technology, such as fibre. This termination could occur at any time during the maximum term of the Transition Unprotected Licence.
- The frequency assigned under the Transition Unprotected Licences should be the same as under the existing licence. This is option 1 proposed by ComReg in paragraph 7.65. However we note that ComReg does not appear to fully support option 1 because the existing frequencies may not be available if "*the new licensee has launched services*". ComReg's position appears to contradict the fundamental objective of the Transition Unprotected Licences to ensure that end users have a service of last resort. If the new licensee has launched services then there can be no justification for a Transition Unprotected Licence to be issued. We do not agree with option 2 which would allow an existing licensee to select an alternative frequency assignment for this reason. If the existing frequency assignment is not available there is no justification for a licence to be issued.
- On the issue of licence fees ComReg presents three options comprising, using existing fees, using existing fees updated for CPI, using fees based on the

[6] Paragraph 7.58, ComReg 15/70

outcome of the award process. ComReg indicates a preference for the second option, using existing fees updated for CPI. Whilst this is preferable to the option of using existing fees, eircom believes that basing the fees on the outcome of the award process is the only justifiable approach as it is based on the market's view of the economic value of the spectrum. This holds irrespective of whether the Transition Unprotected Licences contain liberalised rights of use or not.

## Other Matters Not Addressed in the Consultation Paper

There are a number of important matters related to the design of a spectrum award process that interested parties should have sight of and the opportunity to comment on. Such matters include, but are not limited to, qualification criteria that will apply to enter the award process, policy in respect of Deposits during the qualification and the auction phases, eligibility rules for round activity, rules for bidders in respect of confidentiality, policy for price increments during the auction process, rules for the derivation of final prices, the maximum permissible number of supplementary round bids etc. eircom looks forward to a subsequent consultation on these important matters which we expect will inform the Information Memorandum for the 3.6 GHz award process.

## Project Timeline

ComReg indicates in this consultation paper its intention to issue its response to the consultation by the end of 2015. ComReg further states[7] that it "*cannot provide further clarity on the overall timelines at this juncture, as this will depend on the nature of responses received among other things, ComReg would reiterate that it remains conscious of the expiry of existing 3.6 GHz licences in July 2017 and is working towards providing clarity on the future of the 3.6 GHz band as far as possible in advance of this date*." As ComReg and some interested parties with previous experience of the MBSA in 2012 will be aware there is a significant amount of preparation required for interested parties to effectively participate in an award process. This includes developing a clear understanding of the rules expressed in the Information Memorandum including participation in one or more mock auctions and preparatory activities such as creating a secure bidding room. Interested parties require a reasonable view of timelines in order to effectively prepare. As it stands ComReg has indicated that a response to the consultation will issue by the end of 2015 and the award process will conclude as far as possible in advance of July 2017. We appreciate that ComReg cannot be definitive at this time on specific dates for the award process but interested parties do need some indication as to when to expect major milestones to occur. eircom requests that ComReg publishes a high level project plan for the 3.6 GHz award process.

[7] Paragraph 8.8, ComReg 15/70

# 7 Eurona Ireland

**Eurona Ireland submission on Proposed 3.6GHz Band Spectrum Award (ComReg 15/17)**

**Section 3 Draft Regulatory Impact Assessment (RIA)**

We agree with the ComReg proposal that the 3.6ghz band be auctioned separately to the grouping of other bands such as 700mhz, 1.4ghz and 2.3ghz.
We support the ComReg proposal that the 3.6 GHz band alone is included in the proposed auction, and no other bands are included in the process.
We also propose the following:

- A larger proportion of the spectrum be used for the delivery of LTE / FWA. There is currently a requirement for licensed spectrum by WISPS in Ireland, as attributed to the fact that a large proportion of the current FWA subscriber base is supported by non-licensed technology. 3.6ghz is not ideal for delivery of mobile services, as demonstrated by the lack of band enabled mobile devices (GSA Report April 2015) and limitations on services such as download caps. ComReg also proposes to release additional spectrum, which is ideal for mobile services.

- A report undertaking the impact of the 3.6ghz band on the national broadband plan currently proposed by the DCNR. It is our view that a cross department report such as this could identify savings, reduce the dependence on state subsidy for the NBP and alleviate the burden on the taxpayer.

- Spectrum should not be allocated to operators on a " future-plans " basis and operators must show short term and medium term plans to utilise the spectrum to its capacity, and eliminate the current pervasiveness of spectrum-hoarding.

**Section 4/5 Proposed Award Spectrum, Award Type and Format.**

We broadly agree with the plans by ComReg to divide the spectrum allocation into the regions as proposed.

We believe that the license duration should be extended from the proposed 15 to 20 years, and be primarily used for LTE-TDD. This would encourage more long-term large scale investment. Furthermore, a review of the assigned spectrum should be undertaken every 5 years to ensure efficient use of the spectrum and the delivery of services to end users. Prior

to expiration of the license, a consultation should be undertaken with the stakeholders at least 5 years before the next award of the spectrum.
We submit a proposal that the period should be extended for a further 10 years, subject t performance conditions. This would enable stakeholders to undertake future directions, investment plans and preparations for any technology upgrading or business changes.

We submit that a cap of 100MHz should apply, in order to diffuse a situation where potentially only two operators in a particular region may collude to stifle competition in that region.

We submit that in order to have a manageable block of apportioned spectrum, that blocks are not of less than 50MHz.

We submit that rollout obligations, to counteract spectrum hoarding, should apply to successful bidders, and failure to comply within specified timeframes should result in loss of access rights to spectrum.

We submit that the proposed minimum pricing is set too high. We believe it is not in the interest of rural subscribers to have the minimum pricing set at this level, given that the providers will in all likelihood have to compete with the proposed subsidised NBP.
Whilst the proposal to base minimum pricing on population may provide simplicity and clarity, we submit a possible alternative may take into consideration the relative affluence / purchasing power of one region over another.
Naturally demand will set its own level, however, setting an initial high limit may prevent many potential bidders from participating.
We submit it would be preferential to alter the payment split to reflect an initial 40% SAF, as opposed to the ComReg proposal of 50%, as this would encourage competition on the basis of lower initial Capex requirements.
The pricing structure is based on the upper end of the scale. Moreover, the cost basis on the assumption of population-coverage is a problematic model to follow. 3.6ghz cannot provide 100% population coverage due to its propagation characteristics. ComReg could estimate a more realistic population coverage by excluding areas that have access to NGA technologies such as fibre or cable modem access. Furthermore, the market size will be reduced even further by inclusion of the recent announcements by Eircom, SIRO and **the** DCENR.

**Section 6 License Conditions**

Subject to interference conditions being met, there should be an obligation on license holders to sub-lease (at viable commercial rates) to other operators in areas where they not plan to provide coverage within a specified time limit. The pricing model should be determined in advance of the spectrum award process.

The obligation to sub-lease spectrum should also apply in situations where a transmitter in one region may be used by another operator to serve a population in an adjacent region, where it can be

shown, to the satisfaction of ComReg, that the leasee's frequency plan does not impact on the main operator.

*Barry Wilson*

*General Manager, Eurona Ireland*

*Eurona Brisknet Ltd. Golf Links Rd, Roscommon*
*Arden Broadband Ltd Main St, Belturbet, Co Cavan*
*barry@eurona.ie*
*087 2500972*

# 8 Imagine

Imagine

# Comments on ComReg Consultation:- Consultation on Proposed 3.6 GHz Band Spectrum Award 15/70

28th August, 2015

# Contents

# 1 Executive summary

Imagine Communications welcomes this opportunity to comment on ComReg's proposals for a Spectrum Award of 3.6 GHz band spectrum. This response to the consultation is part of a series of related consultations by ComReg and DCENR that began in September 2014[1]. Numerous respondents, including Imagine, have responded to ComReg stating that the 3.6GHz band spectrum has uncertain demand for Mobile broadband use, at least in the short term, but that it is ideally suited to support a FWA NGA network. Such a network would also help to allow the Irish State to cost-effectively meet the objectives of the National Broadband Plan. Imagine believes that the existing proposal by ComReg is fundamentally flawed because it fails to address the fact that FWA-based NGA networks are a competitive infrastructure in the NGA market, which is a fundamentally different than a general WBB or Mobile Broadband market – with different social economic benefits, different Regulatory Impact considerations and different spectrum award considerations.

Imagine are the only operator that has submitted concrete plans for the investment in and deployment of NGA infrastructure using LTE Advanced Fixed Wireless. The commercial deployment is fully funded and represents an investment of over €300 Million in the next 5 years. This investment will significantly reduce the scale and cost of the State Intervention. In addition Imagine and its partner Macquarie Capital have demonstrated to the DCENR its interest and capability to bid for the State Intervention NGA contract funded through significant private investment. Using Fixed Wireless LTE Advanced to deliver NGA services Imagine can be an effective competitor in the NGA market, extend the coverage of current commercial networks and planned investments reducing the scale and cost of the State Intervention and ensure an efficient tender process to further reduce the Intervention costs.

To deliver on this in line with the National Broadband Plan we need clarity now that we will have sufficient spectrum post 2017 when our current licences expire. Comreg and the DCENR are aware that our investment and rollout is subject to clarity on the spectrum and has been impeded pending the completion of the spectrum consultation process. While the removal of the 3.6Ghz Spectrum from the proposed wider use on the basis of the responses to consultation was considered very positively, the proposed approach in the current consultation illustrates a complete lack of joined up thinking as between Comreg and the NBP Objectives. No provision is made to ensure the required spectrum to facilitate NGA investment at all, let alone within the timeline set out in the NBP.

This approach is impeding competition and investment in the market, delayed the rollout of NGA broadband services, creates investment uncertainty and the serious risk of the loss of significant committed inward investment and the significant and unnecessary increased cost to the state of intervention. While on a standalone basis and given the loss of significant private investment and increased cost to the exchequer at a crucial time of our economic recovery this lack of coordination and use of spectrum which is a state asset to reduce the cost to the state is difficult to comprehend.

[1] ComReg 14/101. Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands, September 2014. http://www.comreg.ie/publications/spectrum_award_-_2_6_ghz_band_with_possible_inclusion_of_700_mhz__1_4__2_3_and_3_6_ghz_bands.583.104700.p.html.

It is even more difficult to understand the current approach when the intervention by the NRA Comreg to (re)allocate spectrum to facilitate effective NGA competition is an obligation under the State Aid Guidelines which regulate the intervention proposed in the Governments NBP

In this response Imagine will review the high level objectives and duties incumbent upon ComReg regarding management of the 3.6GHz spectrum in the context of national policy, identify flaws in the spectrum award process proposed by ComReg and to identify an approach that addresses all these issues consistent with satisfying both national policy and ComReg's statutory duties.

## 1.1 The National Broadband Plan

In response to the EU Digital Agenda for Europe[2] (DAE), the Irish Department of Communications, Marine and Natural Resources (DCENR) established a National Broadband Plan (NBP)[3] and its 2014 update[4]. Compared to other developed countries in Europe, Ireland is a highly rural society with 38.1% population in rural areas. This presents a challenge in achieving both the DAE and the NPB in a cost-effective manner. Completing the "last mile" in low population density areas is an area where wireless and particularly Fixed Wireless Access (FWA) technology can provide rapid and cost-effective connectivity and avoid the high cost of wireline deployment in rural areas.

The April 2014 NBP update announced a proposed intervention[5] by DCENR to *"[deliver] quality and reliable high speed broadband that includes a major fibre build out to rural areas*". This intervention recognises that the market has not been able to deliver commercial high quality broadband and seeks to identify the conditions under which state aid can be used to help meet the NBP.

Most recently the DCENR has published its "Draft Intervention Strategy[6]" which following public consultation will be finalised and submitted to the European Commission for the approval of the proposed State Intervention.

## 1.2 Comreg Obligations under the National Broadband Plan

The approach embodied in ComReg's proposed award process has a number of attributes that make it unsuitable and inappropriate. In particular, ComReg approach the award process as though it can be considered on a purely stand-alone basis with no interrelationship with any other factors – in particular its failure to take account of its obligations under State Aid Guidelines in the context of the NBP. Although the SAG guidelines have broader areas of applicability, they impose an obligation *inter alia* to use regulatory intervention by the National Regulatory Authority (ComReg) to ensure

[2] The Digital Agenda for Europe. http://ec.europa.eu/digital-agenda/

[3] "Delivering a Connected Society - A National Broadband Plan for Ireland". August 2012. http://www.dcenr.gov.ie/NR/rdonlyres/1EA7B477-741B-4B74-A08E-6350135C32D2/0/NBP.pdf

[4] http://www.dcenr.gov.ie/Communications/National+Broadband+Plan/National+Broadband+Plan+Update+April+2014.htm

[5] The EU has published guidelines on what is considered suitable state aid (State Aid Guidelines (SAG)). This considers providing NGA connectivity using LTE-A in some environments to be suitable, but not some lower speed connectivity. See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:025:0001:0026:EN:PDF.

[6] DCENR Ireland's Broadband Intervention Strategy "Proposed Intervention Strategy.pdf"

development of the commercial NGA market including removing barriers to entry, ensuring infrastructure competition and facilitating commercial investment as a precondition of assessing and determining the appropriateness, scale and cost of any intervention measure.

Particular reference is made to para. 44 where it specifically requires that spectrum allocation be used. It says

> *"…….Granting authorities shall also take into account spectrum (re-)allocations leading to possible network roll-out in the target areas that could achieve the objectives of the granting authorities without the provision of direct grants."*

ComReg's proposed award process fails to take account of the broader issues at play in the market and its obligations, as part of the state, to use the full assets of the state to minimise any potential intervention in the market so that the intervention can comply with the rigorous SAG. Not alone does the current proposed award process not favour using the spectrum for NGA service deployment it relegates it to being merely one of a number of potential applications – all effectively treated equally based solely on how much one is prepared to pay for the spectrum. This is fundamentally flawed.

The fact that ComReg appear prepared to proceed to award spectrum on such a basis and where a party, such as Imagine, have established and fully funded FWA NGA plans ready to go but are unable to launch because spectrum has been awarded to another party for an unspecified use will cause very considerable difficulties in getting State Aid approval for the NBP and must throw doubt over the sustainability of any such spectrum award. It is ComReg's failure to recognise these factors that leads it to the erroneous conclusion that an auction process is the most appropriate. This matter is discussed in more detail later in this response.

## 1.3 ComReg's Duties and Responsibilities

ComReg was established by the 2002 Communications Act and has a wide range of responsibilities including "*promoting competition, for protecting consumers and for encouraging innovation"* [7].

Section 12(4) of the 2002 Act provides that, in carrying out its functions *"ComReg must have appropriate regard to 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".*

Policy Direction No.3 on Broadband Electronic Communication Networks notes that *"ComReg 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".* Whilst this 3 year time period has elapsed the national objective is still to be met and so it would appear rational for the Irish State to have extended this time period so that ComReg can still act to facilitate State Policy (including the National Broadband Plan*, published by or on behalf of the Government)* as part of its overall function and spectrum award considerations.

## 1.4 Deficiencies in ComReg's proposal approach

[7] ComReg Website. Roles (What We Do). https://www.comreg.ie/about_us/roles_what_we_do.523.html.

Imagine is of the view that ComReg's existing award process is flawed. The key flaws are identified below:

### 1.4.1 'Fixed NGA' is the relevant market for the 3.6GHz auction

The primary requirement, demand and use for this spectrum is Fixed Wireless NGA and the relevant market to be assessed is ' NGA' which as defined includes Fibre and Cable infrastructure and excludes mobile. ComReg are also aware that the EU has designated NGA as a market and that FWA (using LTE-A) has been identified by the EU[8] as a suitable technology that can meet the conditions required for NGA services.

From consultation responses, for the foreseeable future, there is no demand for the 3.6GHz band from any other service other than NGA and FWA (including mobile broadband whose future demand, if any, is highly uncertain) Despite this, ComReg's award process is focussed on mobile broadband applications and there is insufficient consideration given to NGA FWA use.

We note that these markets would have different private values and social economic benefits for NGA and mobile broadband use and while there is substantial evidence based assessment of the demand for NGA and the market as detailed in the NBP, Comreg ignores this in favour of a subjective view of a clearly uncertain and undefined demand for possible future mobile use for which no market exists. This results in a flawed award process.

We pointed out in our 14th November response to ComReg's 30th September Consultation on the award of 2.6GHz and other bands[9], that ComReg was *"inappropriately conflating two quite distinct markets, for fixed and mobile broadband, under a single vague category of 'wireless broadband' apparently because the two services can use similar underlying technology (LTE)."* . Continuing to do this results in an award process which is simply not fit for purpose and is flawed as it fails to deal with the distinct technical, economic, spectrum valuation, competitive impact and social benefit characteristic of very different markets and use.

Finally, we note that ComReg appear to have been selective in their summary of their own consultants' supporting materials for the current consultation: DotEcon who recognised the lack of mobile demand for the spectrum and Plum who acknowledged the capability and suitability of the 3.6GHz band to provide NGA services over a FWA network.

### 1.4.2 ComReg's proposals do not properly address competition concerns given the failure to identify the relevant market

The failure to identify 'NGA' as the relevant market means that the award process has not considered the appropriate measures to protect and ensure effective competition in that market. Properly designed advanced LTE services delivered using FWA will compete with fixed line NGA, and indeed are likely to be more cost effective than fixed line solutions in many areas. As the NGA market is not considered no provisions to encourage "new entrants " into the market are made and

[8] EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks , (2013/C 25/01). Para (57)

as designed existing NGA operators could have an incentive to acquire and hoard 3.6GHz spectrum for anti-competitive reasons in order to foreclose competition from FWA in the NGA market.

There are no restrictions or caps imposed on existing NGA operators to prevent them from acquiring spectrum and blocking new entrants. The minimum rollout requirements are so low that they do not act as a disincentive as the economic benefit of blocking competition outweighs the cost. This is also likely to result in an inefficient use of spectrum.

As a result we believe it is essential that proposals for auctioning the 3.6GHz band consider actions, such as applying spectrum caps to existing fixed line NGA providers, to prevent future distortions of competition in the 'Fixed NGA' market and rollout commitments which ensure efficient use of spectrum and effective competition which are relative to the relevant market.

Failure to ensure competition in the relevant market is inconsistent with ComReg's duties and will not be compliant with the SAG obligations[10]. This failure therefore jeopardises the ability of the DCENR to achieve the NBP since State Aid could be withheld or subject to challenge for any infrastructure deployment.

### 1.4.3 The auction design is unduly biased towards mobile at expense of NGA and FWA

**Other points**

ComReg's minimum pricing approach, although it makes reference to current FWALA fees, is based upon benchmarking with bands used for mobile broadband. The justification for this is not convincing given the uncertainty of mobile broadband use in 3.6GHz. Setting minimum prices risks pricing out FWA operators who want to compete in the relevant NGA market. Focusing on the private values that Mobile Operators apply to spectrum does not consider the more strategic social economic benefits that the State could expect if this spectrum is used for Fixed NGA use.

MNOs' valuations of the spectrum might exceed the true or intrinsic value as a result of strategic bidding. Given the level of uncertainty over future MNO demand, MNOs may each value the 3.6GHz very differently. However, the desire to avoid being at a future competitive disadvantage may artificially inflate the amount that MNOs are willing to pay for spectrum as seen in some of the European 3G auctions. ComReg's auction design does not guard against the risk that FWA providers are priced out of the market by excessive valuations on the part of the MNOs.

### 1.4.4 Precedents and Obligations for promoting NGA and FWA usage in 3.6GHz

We believe that there are some good precedents for promoting the allocation of 3.6GHz to FWA. Ofcom's decision to renew the 3.4GHz licence of UK Broadband is a good precedent for promoting FWA usage, as noted in our previous submission. This decision effectively reserved spectrum to allow at least one FWA NGA service provider. ComReg makes the point that the way in which Ofcom renewed UK Broadband's licence, making it indefinite, is not common in the EU. However, ComReg

[10] EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks , (2013/C 25/01).

ignores Ofcom's true objectives which were to establish an FWA provider in order to expand choice, promote competition in fixed broadband and to promote sustainable investment.

Second, the Czech regulator CTU, is proposing to auction the 3.7GHz band. The auction will play a key part in the Czech national broadband strategy and they are proposing to reserve spectrum for a new entrant to deliver 'Fixed NGA' services, i.e. 30Mbps download. Although mobile operators will be able to bid for non-reserved spectrum, the main goal appears to be the provision of national broadband internet services. The request of Czech MNOs to postpone the auction to the long term[11] underlines the current lack of mobile demand for the spectrum not only in Ireland but across the EU.

## 1.5 Imagine's proposals

Imagine have considered all of the above and believe that a solution exists that can reconcile all issues in line with ComReg's Obligations and allow ComReg to assist DCENR in meeting the State's NBP and SAG obligations, and improve competition at retail and wholesale level for NGA broadband for consumers.

We propose that ComReg:

- Release the 350MHz of spectrum as two classes of Licence (A-type and B-type) with different conditions
- The A-type licence would be a National Licence of a minimum of 160MHz of spectrum and would have specific conditions ensuring a rapid national NGA rollout of a network that can support open, wholesale access of fixed NGA services across the country. This would encourage NGA competition in both infrastructure and at a retail level and support the National Broadband Plan
- The B-type licences would consist of lots from the remaining 190MHz of spectrum and have less restrictive rollout conditions, and would be awarded under conditions broadly similar to the approach that ComReg is currently proposing which allows mobile operators to consider their value for the spectrum given their unlikely, but conceivable, future demand for the spectrum.

This approach recognises the significant importance of NGA in the context of the NBP. Notwithstanding the lack of evidence to support mobile as a relevant market for the 3.6GHz band, this allows the market scope to resolve the uncertainty over future mobile broadband demand, while avoiding uncertain future mobile use or protectionism from potentially distorting the auction process. Hence, the auction will be able to deliver the full benefits of FWA including better provision of rural NGA and increased fixed NGA competition. This two licence class approach has been used previously in Ireland and elsewhere to achieve competitive, social economic benefits, for example, to boost competition in Ireland at the release of the 3G mobile spectrum[12] and in the UK 3G auction which saw the disruptive and innovative entry of Hutchison 3G into the UK market. It is particularly useful in attracting new infrastructure investment.

[11] http://www.telecompaper.com/news/ctu-evaluates-comments-on-3600-3800-mhz-auction-rules--1036879

[12] See http://www.comreg.ie/_fileupload/publications/odtr0196.pdf.

The Type-A licence should be awarded as part of an administrative award process with rollout conditions in terms of the Rate, Scale, Technical Performance, geographic deployment etc. aligned with the NBP objectives and in advance of the implementation of the NBP. The B-type licences can be awarded broadly in line with the current approach with some amendments to reflect the different use.

This is the optimal use of the spectrum, consistent with the market expectations of consultation respondents and is in line with ComReg's obligations. This approach will best serve the market and customers and will minimise the need for state intervention by enabling commercial network deployment over a wider area than is supported at present.

## 1.6 Need for a fast decision

Imagine urges ComReg to reach a clear and timely decision on the approach to awarding this spectrum. The uncertainty over Imagine and other FWA operators' access to this spectrum has a negative impact on the ability to secure and retain full funding for investment.

Lack of clarity on licensing and availability of the 3.6GHz band is already impeding commercial deployment and risks undermining the NBP. Quickly developing an award process that recognises fixed NGA as the relevant market and ensures that at least one operator will be in a position to deploy FWA is critical to ensuring compliance of the NBP with SAG.

We urge ComReg to instigate an administrative award process for the Type-A licence as soon as possible and conduct an appropriate auction process for the Type-B licences.

# 2 Introduction and Context

Imagine welcomes this opportunity to comment on ComReg's proposals for a Spectrum Award of 3.6 GHz band spectrum. Imagine believes that this spectrum is perfectly suited to addressing Ireland's inadequate next-generation broadband provision via fixed wireless access (FWA) and would seek changes to the proposed award process. Imagine recognise that ComReg has responded to input received and has evolved its original proposal on how to award the 3.6GHz spectrum; in this response Imagine identify a further evolution that will address numerous deficiencies identified by respondents to the previous consultation process, which is consistent with ComReg's policy, duties and obligations and also helps achieve the Government's objective of delivering NGA grade services to citizens and consequently supporting meeting the National Broadband Plan objectives.

## 2.1 ComReg's Duties and Obligations

ComReg was established by the 2002 Communications Act and has a wide range of responsibilities including "*promoting competition, for protecting consumers and for encouraging innovation"* [13].

Section 12(4) of the 2002 Act provides that, in carrying out its functions *"ComReg must have appropriate regard to 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".* This means that although ComReg is an independent Regulatory Agency is has an obligation to support national policy and should seek to use its powers to support national policy in the national economic interest. This over-arching consideration to support national policy must therefore be of higher priority than ComReg's more technical duties, such as maximising the efficiency of spectrum use.

Policy Direction No.3 on Broadband Electronic Communication Networks notes that *"ComReg 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".* Whilst this 3 year time period has elapsed the national objective is still to be met and so it would appear rational for the Irish State to have extended this time period so that ComReg can still act to facilitate State Policy (including the National Broadband Plan) as part of its overall function and spectrum award considerations.

## 2.2 Background - Spectrum Consultations

[13] ComReg Website. Roles (What We Do). https://www.comreg.ie/about_us/roles_what_we_do.523.html.

In September 2014, ComReg proposed in a consultation (ComReg Document 14/101[14]) the release of 3.6GHz spectrum along with the release of other spectrum at 700MHz, 1.4GHz, 2.3GHz and 2.6GHz more suited to mobile applications. Imagine responded (Imagine Response to 14/101[15]) noting that a key deficiency in the proposed approach was in conflating 2 distinct markets (fixed and mobile broadband) and suggested that the 3.6GHz spectrum should not be awarded along with the other bands.

In December 2014, ComReg issued a call for input on the regulatory implication of the National Broadband Plan (ComReg Document 14/126[16]) to which Imagine responded (Imagine Response to 14/126[17]) that FWA is noted as having a role in meeting the National Broadband Plan (NBP) and in meeting basic, particularly rural, broadband deficits.

In response to input to its Consultation on 2.6GHz and other bands, ComReg released an update[18] noting that the 3.6GHz band "had certain characteristics […] which would differentiate it from, and might justify its different treatment to, other bands ... ". In the consultation process it has been recognised that there is no mobile demand for the 3.6GHz band for the foreseeable future (as noted by Mobile Network Operators (Vodafone, 3), equipment suppliers (Huawei, Qualcomm) and DotEcon (ComReg's consultants)).

Imagine recognises that ComReg is now minded to award this 3.6GHz spectrum separately from other bands more suited to supporting mobile applications, but would like to take this opportunity to identify further areas where ComReg can improve this award process and to pay heed to the aforementioned submissions on this 3.6GHz consultation bearing in mind the overall market environment created by the related NBP consultations, planned NPB intervention and obligations for ComReg and the State that therefore arise.

Imagine believes that the 3.6GHz spectrum is perfectly suited to addressing Ireland's inadequate next-generation broadband provision via fixed wireless access FWA. Imagine welcomes the fact that ComReg is now proposing to award 3.6GHz separately to the other bands. However, there are still some important issues to be resolved. In this response, Imagine identify a further evolution of the award process that will address numerous deficiencies identified by respondents to the previous consultation process and which are consistent with ComReg's policy, duties and obligations and also helps achieve the Government's objective of meeting the National Broadband Plan.

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[14] ComReg 14/101. Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands, September 2014. http://www.comreg.ie/publications/spectrum_award_-_2_6_ghz_band_with_possible_inclusion_of_700_mhz__1_4__2_3_and_3_6_ghz_bands.583.104700.p.html.

[15] Imagine Consultation Response to ComReg 14/101. Comments on ComReg Consultation: Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands. Non-confidential response at: http://www.comreg.ie/_fileupload/publications/ComReg1515.pdf. Confidential note also provided to ComReg.

[16] ComReg 14/126. National Broadband Plan - Call for Input on Regulatory Implications. December 2014. http://www.comreg.ie/publications/national_broadband_plan_-_call_for_input_on_regulatory_implications.583.104732.p.html.

[17] ComReg 14/126S. National Broadband Plan Call for Input on Regulatory Implications. Submissions to Call for Input. March 2015. http://www.comreg.ie/_fileupload/publications/ComReg14126s.pdf.

[18] ComReg 15/14: Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands (ComReg Document 14/101). Feb 2015. http://www.comreg.ie/_fileupload/publications/ComReg1514.pdf

**State National Broadband Plan (NBP)**

In parallel with ComReg's consultations regarding the 3.6GHz spectrum, the DCENR (Department for Communications, Energy and Natural Resources) consulted on where state intervention may be required to meet the NBP (the Mapping Consultation[19]). Imagine and other potential service and wholesale providers responded[20]. ComReg are an advisor to the DCENR in this process, providing their technical, wireless and regulatory wireless expertise. Through this route, and from direct communication between Imagine and ComReg, you are aware of Imagine's planned approach to deliver commercial FWA NGA and to support delivery of the National Broadband Plan. ComReg are also aware that the EU has designated NGA as a market and that FWA using LTE-A configured to be used for Fixed Access has been identified by the EU as a suitable technology that can meet the conditions required for NGA services. Importantly, LTE-A configured for mobile use is not a qualifying NGA technology.

**ComReg's Current Approach**

ComReg's current approach to the process of awarding the 3.6GHz spectrum is flawed. It is our strong view that the relevant market for the 3.6GHz band is fixed NGA and fixed wireless access delivering NGA services is therefore the most, if not only relevant use and for which an equipment ecosystem exists. Despite this, ComReg's award process is focussed excessively on mobile applications and the fixed NGA market has not been adequately considered, biasing the Regulatory Impact Assessment and leading to an incomplete analysis. We will deal with this issue in detail in Section 3.

In addition, the failure by ComReg to take full account that the broader context which applies to the 3.6GHz award in the context of an impending market intervention (as envisaged in the NBP) imposes obligations on ComReg to ensure its award process has taken account of these factors and that it has acted to actively promote commercial NGA investment which will consequently minimise any required state led market intervention. Not alone has ComReg not acted actively to favour commercial NGA uses of the 3.6GHz spectrum it appears to favour unspecified potential future mobile uses. This is a serious omission and one which requires a fundamental re-think on the award process.

Fundamentally, ComReg appear to be determined to use the same award process as they used previously in the much referenced mobile spectrum award. This attempt to shoehorn the FWA (fixed NGA) market into a process that worked acceptably for mobile services completely ignores the fundamentally different dynamics of these market spaces and the fundamentally different nature of the economics involved and application of the technology..

It must continually be remembered that there is an infrastructure deficit in Ireland for a reason. If the fixed line market space was as profitable as a mobile market there would be no deficit to begin

[19] High Speed Broadband Map 2016. November 2014. http://www.dcenr.gov.ie/communications/Lists/Consultations%20Documents/NBP%20Mapping%20consultation/NBPMappingConsultation.pdf

[20] National Broadband Plan, Public Consultation Submissions 2015. http://www.dcenr.gov.ie/communications/SiteCollectionDocuments/Broadband/Mappingconsultationsubmissions.compressed%20(1).pdf

with and therefore attempting to ascribe similarities between these markets or worse, conflating them together, will ensure that this deficit will continue to exist and may even get worse. Despite how convenient it would be for ComReg to treat this as a 'proxy' for a mobile market it is not one and will never be one. The whole approach in the consultation award process for the 3.6GHz spectrum can be characterised as one which is attempting to justify the utilisation of the previous 'mobile' award mechanism purely because it is convenient to do so and not because it is the best process for dealing with the unique issues which face Ireland in delivering NGA services to regional and rural Ireland and doing so in a manner that eliminates the infrastructure deficit permanently.

While previous spectrum awards as referenced dealt with mobile markets the current award is substantially different as it is dealing with the convergence of distinct markets using a common wireless technology. However the technology does not define the market and addressing the needs of the distinct nature of these markets necessitates an award process fit for that purpose. Ignoring this challenge and choosing a process which was based purely on mobile has the obvious consequence of failing to address the needs of the fixed market.

It is simply not satisfactory for ComReg to blithely ignore the unique role 3.6GHz has to play in dealing with these issues simply because it is familiar with a process it has used before and because it can justify its use by the selective interpretation of the responses received. The approach is flawed and will not deliver the optimum result either for the state, its citizens nor the industry.

**The Broader Context which impacts the 3.6GHz Award Process**

Provision of NGA to all citizens to bridge the digital divide has been adopted as government policy and it has been recognised as requiring State Intervention which will require clearance from EU in compliance with established State Aid Guidelines (SAG). SAG guidelines impose an obligation *inter alia* to use regulatory intervention by the National Regulatory Authority (ComReg) to ensure development of the commercial NGA market including removing barriers to entry, ensuring infrastructure competition and facilitating commercial investment as a precondition of assessing and determining the appropriateness, scale and cost of any intervention measure.

Amongst other factors, the principle of technology neutrality, facilitating the use of all qualifying technologies and actively maximising the use of existing state assets (e.g. spectrum) and regulatory and legislative measures to maximise commercial investment in order to minimises the extent of the intervention into the market is required in order to be compliant with SAG. This maximises the effectiveness of the competitive market and minimises the cost of state intervention as required under SAG.

The provision of NGA services using qualifying TD LTE Advanced Fixed Wireless Infrastructure requires the availability and allocation of sufficient spectrum. To ensure compliance with SAG guidelines in relation to development of the commercial market, technology neutrality and minimising cost and avoiding market distortion the guidelines impose an obligation to use regulatory intervention by the NRA to (re) allocate spectrum.

On the basis of the most recent ComReg Consultation and proposed auction process the availability and allocation of Spectrum to deliver NGA services will, at best, be uncertain until the conclusion of the auction which appears to be unlikely to conclude until to mid-2016.

The current regulatory process and preliminary proposed approach in the Consultation is inconsistent with the approach, objectives and proposed timing of the Governments NBP and in contravention of the obligations of the State under SAG.

The extent of the disjoint that exists between ComReg and government policy can be most easily demonstrated by the fact that Government have clearly flagged that the delivery of NGA grade services to citizens that will not have such access through traditional commercial investment is a national priority yet ComReg do not even recognise the NGA market as a market at all let alone a market that is of strategic national importance.

This is merely one aspect of an isolationist and disjointed approach to solving a clear national problem. Delivery of NGA services is a national priority and fixed wireless must be a preferred use for the 3.6GHz spectrum if it is for such NGA use. To not prefer fixed NGA services in the award process is irreconcilable with the European Commission's Digital Agenda for Europe (DAE)[21] as adopted in the NBP, government policy, ComReg obligations and customer need.

**Context of Statutory Obligations**

ComReg, as the NRA have a number of obligations amongst them Policy Direction No. 3 on Broadband Electronic Networks where it says that:

> *"ComReg 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."*[22]

It is reasonable that given the imminent nature of what will probably be the largest ever state intervention in the communications market that this policy direction would be seen as quite important in ComReg's analysis. Even more so given ComReg's intimate involvement with and participation in the DCENR process. However, ComReg dismisses this important issue in its response where it says

> *"ComReg is cognisant of the fact that the three year objective described in this policy direction has now expired making this direction less relevant currently. In any case, ComReg is of the view that the Preferred Option is aligned with this Government objective, insofar as it is most likely to maximise utilisation of the available radio frequency spectrum for WBB services. For example, it would promote the introduction of advanced WBB services in the 3.6 GHz band at the earliest possible date and it complements other schemes aimed at ensuring the widespread availability of, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis."*[23]

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[21] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2010) 245 final, *A Digital Agenda for Europe*.

[22] Policy Direction No.3 of 21 February 2003 on Broadband Electronic Communication Networks

[23] Para 3.172 of Consultation on Proposed 3.6 GHz Band Spectrum Award - ComReg 15/70

This is a fundamental error in actively dismissing a clearly highly relevant policy direction on the basis that it has 'now expired'. Quite to the contrary, the criticality of government policy and its impact on the current award process could not possibly be more relevant now than at any other time in light of the planned intervention into the market by the State. This planned intervention brings obligations in this regard to the fore and it is the responsibility of all agents of the state to ensure compliance with SAG. This will be dealt with in some detail in the following paragraphs but it must also be stated here that the continued attempt to ignore the relevant NGA market and conflate it with a broad (and essentially undefined) WBB continues to receive an inappropriate preference justified only on the basis that the most relevant policy direction is an obligation to ensure efficient use of spectrum. Finally, it is unclear how government policy, which is to deliver NGA services to customers, can be reasonably equated by ComReg to mean an obligation to maximise utilisation of the available radio frequency spectrum for WBB services. This is incorrect since utilisation of spectrum for WBB (efficiently or otherwise) does not necessarily translate into NGA service delivery to customers. In this interpretation ComReg has erred.

**Obligation to align Spectrum Award with State Aid Guidelines (SAG) in the context of the National Broadband Plan**

The European Commission has clearly established the critical importance of high speed broadband services to the European Market and its citizens in the Digital Agenda for Europe (DAE). Consistent with the European objectives to provide NGA broadband services as set out in the DAE and in compliance with the obligations under SAG, DCENR has developed the NBP and Draft Intervention Strategy. In compliance with SAG, the NBP clearly sets out in detail the critical benefit to the economy and the citizens of Ireland in providing NGA high speed broadband services, it clearly identifies the NGA technologies and infrastructure which can deliver these NGA services and the NGA market as the relevant market for the assessment of planned commercial deployments. It also sets out a process which identifies where there is market failure, the areas requiring State Intervention.

As required under the SAG, to clearly determine where State Intervention may be appropriate and justified, this has included extensive assessment by DCENR and its independent consultants to identify planned commercial deployments of qualifying NGA infrastructure to fully assess the commercial market for NGA services. Approval of any proposed state intervention is subject to full compliance with SAG and the approved approach and mechanism governing the intervention is also subject to EU Public Procurement Directives ensuring openness and transparency for all parties wishing to bid for the implementation or management of the subsidised project.

The most recent ComReg Consultation and the currently proposed award process is inconsistent with, and conflicts with, the NBP, the DAE and SAG and risks putting the NBP and planned Intervention in substantive breach of the SAG.

The current approach that the regulation of the market and the allocation of Spectrum is completely separate from and independent of the NBP is simply misguided and at variance with obligations under SAG.

While the DCENR is the Authority through which the NBP and proposed intervention is coordinated, this is an intervention by the State. The NRA (ComReg) is an instrument of the State to Regulate the Communications Market under the EU common regulatory Framework for Electronic

Communications Networks and Services (Framework Directive)[24]. Both the DCENR and ComReg fall under the same Minister and have a role in the implementation Government Policy and obligations that arise in its capacity as an agent of the state.

As the NBP is intervention by the State, it is the State which must comply fully with the SAG for the approval of any intervention. Contrary to what appears to be ComReg's current view, the role of the NRA under the SAG is not limited to an advisory role but presumed under SAG to be an active instrument of the State which *has* been used to promote effective NGA investment and competition in the market and *will* be used to ensure further commercial investment. The use of the NRA and regulatory measures to maximise commercial investment in effective NGA infrastructure competition and minimise intervention is not just in the interest of the market but a fundamental principle and obligation of the State (and ComReg as NRA) under SAG.

> *(3) The electronic communication sector has undergone a thorough liberalisation process and is now subject to sectoral regulation. The EU regulatory framework for electronic communications also provides harmonisation rules concerning broadband access (5). With regard to legacy broadband networks, wholesale markets are to date subject to ex ante regulation in the majority of Member States. The regulatory approach has proved successful to foster competitive markets, to encourage investment and to increase consumer choice: for example, the highest broadband coverage and take-up is found in Member States with infrastructure competition, combined with effective ex ante regulation to promote service competition. Further deployment of broadband networks and in particular of Next Generation Access (NGA) networks continues to require the intervention of the national regulatory authorities (NRAs) due to their role in the electronic communications sector*
>
> *(42) The role of NRAs in designing a pro-competitive State aid measure in support of broadband is particularly important. The NRAs have gained technical knowledge and expertise due to the crucial role assigned to them by sectoral regulation. They are best placed to support public authorities with regard to the State aid schemes and should be consulted when target areas are being identified. Member States are encouraged to provide NRAs with the resources they need to give such support. Where necessary, Member States should provide an appropriate legal basis for such involvement of NRAs in State aid broadband projects. In keeping with best practice, NRAs should issue guidelines for local authorities which include recommendations on market analysis, wholesale access products and pricing principles taking into account the Electronic Communications Regulatory Framework and relative Recommendations issued by the Commission."*[25]

[24] Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (framework directive).

[25] EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks

(2013/C 25/01)

This specifically includes the allocation of spectrum to facilitate NGA investment.

> "(*44) So that the measure is properly designed, the balancing test further requires that State aid is an appropriate policy instrument to address the problem. In this respect, whilst ex ante regulation has in many cases facilitated broadband deployment in urban and more densely populated areas, it may not be a sufficient instrument to enable the supply of broadband service, especially in underserved areas where the inherent profitability of investment is low……. Hence, in some situations there may be no alternative to granting public funding to overcome the lack of broadband connectivity.* ***Granting authorities shall also take into account spectrum (re-)allocations leading to possible network roll-out in the target areas that could achieve the objectives of the granting authorities without the provision of direct grants. "***[14] *(emphasis added).*
>
> With respect to the distortion of competition in the market assessment process:
>
> "(*76) An area should be considered a 'grey NGA' area where only one NGA network (89) is in place or is being deployed in the coming 3 years and there are no plans by any operator to deploy a NGA network in the coming 3 years.* ***In assessing whether other network investors could deploy additional NGA networks in a given area, account should be taken of any existing regulatory or legislative measures that may have lowered barriers for such network deployments*** *(access to ducts, sharing of infrastructure, etc.).* ***The Commission will need to carry out a more detailed analysis in order to verify whether State intervention is needed since State intervention in such areas carries a high risk of crowding out existing investors and distorting competition. In this respect, the Commission will carry out its assessment on the basis of the compatibility conditions established in these Guidelines."***

In failing to recognise the importance of the provision of 'Fixed NGA' services as the relevant market and in failing to prefer Fixed NGA as the use of the spectrum ComReg's assessment of the use of and demand for the 3.6Ghz Spectrum is inconsistent and conflicts with the DAE, the NBP, SAG and DCENR market analysis underpinning the NBP.

Inconsistent with the substantial evidence based assessment of the relevant NGA market required under SAG and set out in the NBP, ComReg's current assessment does not attach the required weight and importance to the NGA market and in fact attaches more weight to a completely subjective and unsubstantiated view of a yet to be determined possible use of spectrum for mobile services at some uncertain point in the distant future.

It is the inconsistent and incorrect analysis of the market and in contradiction to ComReg's obligation to use the spectrum assets to minimise any state intervention in the market in the current consultation by promoting Fixed NGA as the preferred use which leads to the proposed award process. Specifically, this proposed process creates uncertainty as to

- the availability at all of any, let alone sufficient, spectrum to facilitate NGA services
- the allocation of the spectrum to facilitate effective competition in the relevant NGA market and
- the outcome or reliability of a process which does not synchronise with the NBP, SAG requirements or the best needs of the market as a whole.

This inconsistent assessment and approach gives rise to a number of significant issues which include:

- The correct identification and assessment of the importance of the relevant market for the award process being the NGA market and not the WBB market as ComReg propose.
- Ensuring and promoting competition and investment in competitive infrastructure in that market
- The timing of the award process for the allocation of Spectrum post 2017 to facilitate the investment and deployment of commercial LTE Advanced Fixed Wireless infrastructure in advance of the determination of the State Intervention, its proposed tender process and the consequent market impact of such an intervention.

It is difficult to comprehend how these inconsistencies could arise given the substantial consultation and engagement on the NBP and ComReg's acknowledged advisory role in the NBP process. A situation where assessment of the market and the importance of NGA services to the economy and the citizens of Ireland by ComReg and DCENR are inconsistent is untenable. By virtue of its own current analysis, which is subject to further input and consideration, ComReg disagrees with the substantial analysis of the market undertaken by DCENR on behalf of government underpinning the current NBP – one aimed at implementing the DAE and successfully securing approval in line with SAG. These inconsistent and different positions as ComReg as NRA and DCENR as the Aid Granting Authority will have significant consequences for the approval of the planned State Intervention under the SAG.

However at this stage the ComReg consultation forms part of the regulatory framework and is an iterative process subject to the views and inputs of interested parties. In relation to the NBP it is of particular note that ComReg makes the following statement in its consultation.

> *"2.6 That being said, ComReg would take this opportunity to:*
>
> - *reiterate that ComReg has no decision-making role in regard to the design of the NBP or the award of any contracts under the NBP;*
> - *and confirm that, to the extent that interested parties have views on how ComReg's spectrum award proposals may, in their view, better align with the NBP (including when more detailed information becomes available about the NBP), then ComReg remains open to consideration of such views in the context of ComReg's own statutory remit."*

As the Grant Aid Authority with responsibility for the co-ordination, design, decision-making role and the award of any contracts under the NBP, DCENR is an interested party and has the opportunity to and obligation under the SAG to make clear their views, if they haven't already done so, on how ComReg's spectrum proposals may better align with the NBP and to address the issues outlined above.

Notwithstanding DCENR's obligations, ComReg itself has its own obligations to ensure its actions as NRA are supportive of, and importantly not in direct contravention of, the state's obligations as a whole under SAG to use all of the assets of the state (specifically including spectrum) to minimise any potential intervention in the market.

Independently under its separate obligations you would assume that Comreg would share the view of the European Commission as set out in the DAE and the Government in the NBP that the provision of NGA services was a priority and in the best interest of consumers and the market.

Imagine have made very clear its intention to deploy extensive NGA compliant infrastructure on a purely commercial basis subject only to receiving the spectrum necessary. These plans are well developed, fully funded and ready to implement. These deployments will significantly reduce state intervention and the award process must favour delivery of NGA services as the preferred use of this spectrum. To consider FWA NGA use to be of no more significance in the market nor more worthy of consideration of a spectrum award than an uncertain mobile application is in contravention of ComReg's obligations under SAG and will result in otherwise ready commercial deployments being cancelled. It is difficult to see how this can be sustained in a successful application for State Aid approval.

ComReg's independence is not challenged by supporting the implementation of government policy and accepting the detailed market and planned competitive NGA infrastructure analysis undertaken by the Department and acting to coordinate the allocation of Spectrum to align with policy objectives such as those reflected in the NBP. If ComReg supports and endorses the NBP as best meeting the needs of the market the State and ensuring effective competition to the benefit of consumers it cannot be compromised and it is indeed obligated to ensure that the allocation of spectrum to facilitate the competitive provision of qualifying NGA services is made in a timely manner. It is imperative to the successful implementation of the NBP and the overall market that this opportunity is taken to ensure consistency and alignment between the Regulatory process and the NBP and to avoid the risk and consequences of non- compliance with SAG as well as directly interfering in what would otherwise be a functioning commercial market.

As detailed in the European State Aid Guidelines, and reflected in the NBP PWC report[26] on Compliance with State Aid Guidelines, approval of State Aid is conditional on fully meeting strict guidelines. The guidelines include measures to maximise commercial investment, avoid market distortion, technology neutrality and aim to minimise the scale and cost of state intervention. If as a consequence of the spectrum award process there is an impact in the commercial market which contravenes these guidelines, State Aid will not be approved.

In addition, in circumstances where the State were to propose Intervention in areas where, subject to allocation of Spectrum commercial operators are prepared to deploy NGA infrastructure and provide commercial NGA services, an obvious issue of market interference and distortion arises. Such state intervention would be a conscious interference in the market and would knowingly directly undermine the business case for commercial investment. It is clear that these issues need to be addressed.

It is clearly in the interests of the NBP, the Government, citizens and the taxpayers and an obligation under the SAG that commercial investment is maximised and that state intervention is minimised. This avoids unnecessary intervention, minimises cost and ensures maximum benefit and choice for the customer. For this to occur there is a requirement and obligation that commercial investment is

[26] PWC Report: "NBP Ireland State Aid Compliance Report, July 2015"

maximised and where intervention is required full use of existing assets is made to reduce cost and minimise interference in the commercial market.

Spectrum is a significant asset and resource of the State. The availability and use of this asset to meet the objectives of the NBP is not only essential to increasing commercial investment and minimising the scale and cost of intervention but an obligation under SAG.

While we are hopeful that the inputs from interested parties will inform a Spectrum Award process in a manner that will facilitate the investment and deployment of competitive LTE Advanced NGA infrastructure, support the objectives of the NBP and be compliant with obligations this will inevitably be subject to the conclusion of the consultation and formal decision notice from ComReg.

We will of course continue to engage with ComReg through the consultation process in an effort to have these matters addressed resulting in an appropriate Spectrum Award Process which facilitates commercial investment and deployment of LTE Advanced Fixed Wireless infrastructure to deliver NGA services and aligns with the objectives, schedule and timeframe proposed in the NBP and which comply with obligations with regard to SAG.

# 3 Failure to define the relevant market

In our view, ComReg's analysis is fundamentally flawed because it fails to identify the relevant markets for the 3.6GHz spectrum. ComReg made the same mistake in its 30th September Consultation on the award of 2.6GHz and other bands[27] where, as we pointed out in our 14th November response, ComReg was *"inappropriately conflating two quite distinct markets, for fixed and mobile broadband, under a single vague category of 'wireless broadband' apparently because the two services can use similar underlying technology (LTE)."*

Although we welcome the fact that ComReg is now proposing to award 3.6GHz separately to the other bands we cannot understand that having based its decision on the fact that this band had different characteristics which made it different to other mobile bands and on the submissions in response to the consultation, which, with the exception of two operators who have NGA competitive interest, unanimously stated a lack of demand for mobile and award for use of Fixed Wireless , that inconsistent and at variance with this Comreg is proposing an auction award which preferences mobile.

Comreg has not taken on board the clear views of the majority of the fixed and mobile market participants and rather than using an Administrative award process to allocate spectrum for the best use to meet FWA NGA demand and drive competition has reverted to and structured an auction award which preferences the submission made by existing NGA operators which could significantly reduce new entrant effective NGA competition.

Vodafone (see pp6 of Vodafone response to ComReg 14/101 in ComReg 15/15) noted that "propagation characteristics at 3.6GHz make this spectrum significantly less suitable for true mobile applications" and that "The likely primary applications are FWA and non line of site transmission links to small cells". In the same document 3 Ireland (pp7 of their response) note that the 3.6GHz band "would have limited value in Ireland for mobile services. With little or no mobile device inclusion this band stands in a different category to the others covered by ComReg's consultation". Huawei note (see page 1 of their response) "We do believe that 3.6GHz LTE is an ideal spectrum band for FWA, and that the use of 3.6GHz LTE FWA for delivery of broadband services in Ireland is realistic to decrease the cost for fixed line engineering, especially in rural areas and some high capacity urban indoor area, and that the use of BAND 42/43 LTE TDD should be encouraged for FWA".

ComReg has not taken on board our conclusion that fixed NGA services were the relevant market for the 3.6GHz band. Neither has it taken on board the evidence we cited to support our case, namely that:

- propagation characteristics and the lack of a developed device ecosystem made 3.6GHz less suitable than other bands for mobile services; and

[27] Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands

- that demand for 3.6GHz from MNOs was low and that spectrum allocated to mobile services in Ireland was more than adequate to meet future demands for mobile services, given Ireland's relatively low population density. This is particularly true in area outside the dense urban conurbations.

In addition, these points were acknowledged by ComReg's auction adviser, DotEcon in the supporting documents that ComReg published to its Consultation. For example, DotEcon said that the supply of spectrum without 3.6GHz may already be sufficient to meet demand at the time of the award and that there was a risk that demand for 3.6 GHz was low relative to availability. Despite this, ComReg appear to be selective in their summary of their own consultants (both DotEcon and Plum) to downplay the capability and suitability of the 3.6GHz band to provide NGA services over an FWA network.

Instead of defining the relevant markets, ComReg approach has been highly subjective, particularly in assuming that mobile broadband is likely to be a credible potential use of the band. This is in the face of substantial evidence to the contrary. Not only does this include our response to the consultation but also that of its own advisors as mentioned above. The evidence also includes that evidence presented by the EU in its State Aid Guidelines and the NBP (where ComReg were part of the steering board) on the important role that FWA can play in delivering NGA.

ComReg refers to *"downstream competition"* a number of times, without defining what the relevant markets are. For example, in paragraph 5.62 on competition caps, ComReg analyses downstream competition in terms of potential usage (unsubstantiated by evidence of demand) and not in terms of relevant markets. *"ComReg observes that there are at least two potential categories of users of 3.6 GHz spectrum, as identified in the response to Document 14/101, mobile operators and fixed wireless operators. As such, the competitive dynamics to be taken into account may vary significantly."*

ComReg relies on conjecture rather than evidence in assessing the views of new entrants in the RIA. For example, in the discussion of the impact of administrative assignment on competition in *paragraphs 3.99-3.106, n*o evidence is provided to support the views which ComReg attributes to new entrants or their importance in deciding how to award 3.6GHz.

In addition, we find that the specific references to competition in downstream markets are superficial and not evidence based. For example, paragraph 5.64 on competition caps notes that *"existing [FWA] operators or new entrants may wish to offer considerably higher bandwidth fixed broadband service based on LTE equipment. As noted by DotEcon, any such services may, at the margins, also be in competition with fixed line and mobile services".* Here ComReg and DotEcon erroneously assert that high speed FWA services over LTE are a very limited substitute for fixed line NGA services. This directly contradicts the findings of the EC which defined fixed NGA as a market and concluded that FWA services were a part of that market[28] as noted in previous submissions[29] to ComReg. Given the clear evidence that FWA can more that offer a marginal service compared to "fixed line and mobile services", ComReg should state the basis for their insistence on neglecting FWA – and in particular its role in delivering Fixed NGA services - as being a key market.

[28] http://ec.europa.eu/competition/state_aid/legislation/broadband_guidelines_en.pdf.

[29] See Section 3 of Imagine Response to 14/101

We strongly urge ComReg to carry out a proper market assessment. A full market definition exercise is not necessary. ComReg can re-use existing analyses such as the EC assessment of the market for fixed NGA services in the Digital Agenda for Europe. The National Broadband Plan, Consultants' report, the DCENR's draft state intervention on the subsidising NGA in underserved areas.

# 4 Impact on Auction Design and Competition

ComReg's failure to identify the relevant markets seriously undermines both its proposed auction design and analysis of competition. In our view, the fixed NGA market is the only relevant market in the short to medium term. Mobile broadband demand is highly uncertain and the MNOs themselves said that they have no demand for the spectrum to the medium term in response to ComReg's previous Consultation (as summarised in paragraphs 2.8 to 2.10 of ComReg's current Consultation).

As we said in our previous response to ComReg, there is a great opportunity for FWA to provide competitive services in the fixed NGA market. Firstly, the whole purpose of the NBP and the DCENR NBP process shows that there is a significant market failure in providing fixed NGA services outside the cities in Ireland (since the fixed line operators, eircom and SIRO, will not provide adequate and affordable NGA coverage in these areas without state subsidy). Secondly, the advent of LTE technology greatly expands the potential of FWA to deliver truly NGA services (on appropriately designed networks).

ComReg mentions in paragraph 2.25 of the current Consultation that the number of FWA subscribers peaked in 2008 and declined thereafter. This implies a continuing decline into the future and fails to correctly observe the reality of the business cycle of the legacy technology and the transfer and upgrade to competitive LTE NGA capable infrastructure. This does not recognise the impact that the transition to FWA will have. Nor does it take into account the more recent impact on investment of the lack of clarity over continued access to 3.6GHz which Imagine and other FWA providers have pointed out to ComReg. Ignoring these facts ComReg references a figure of c. [45,000] customers as being served from FWA operators and cites this low figure as justification for its marginalising of FWA in the process

Notwithstanding the above even in relation to this number it must be pointed out that. However, in DCENR published documentation issued recently as part of the NBP process[30] it points out that *".ComReg collects data only of FWA operators who have a certain financial turnover. In fact, there may be as many as 80 FWA operators in total, particularly in rural areas. The total number of subscriptions might be as high as 150,000, of which 125,000 in rural areas".* It could be interpreted that ComReg is deliberately under sizing the scale of the FWA market by a considerable multiple which under sizing appears to support the ComReg marginalisation of FWA in favour of highly speculative mobile uses (for which it has no evidence) and simply to fit a previously used award process.

ComReg now has the opportunity to take a more focused approach to awarding the spectrum that can reconcile the unique position of FWA services as the only credible use of the 3.6GHz for the foreseeable future with the longer term uncertainty over mobile broadband. The auction should recognise the utility of FWA use for delivering much needed NGA services and we propose splitting the 350MHz into two different allocations with different roll-out conditions. We set out both these proposals in more detail in Section 9 ("Options for promoting competition in fixed NGA") of this

[30] State Aid Compliance Report.PDF

document. This is likely to generate the most efficient use of spectrum and greatest value to consumers and to society in terms of helping to achieve the goals of the National Broadband Plan.

A key reason to split the spectrum is to consider the welfare value of having an NGA network that can increase competition and support (rural) NGA access, consistent with roll-out conditions imposed on some of the spectrum released. Disposing of spectrum using a standard auction format without relatively stringent roll-out conditions would make the spectrum more attractive to Mobile Operators or existing fixed NGA operators intent on preventing competition, and may attract higher bids for the spectrum. However this would forego investment in NGA infrastructure and resultant benefits to consumers and the competitive market. It is often assumed that an auction process will allocate spectrum to the best user of spectrum – but this logic is flawed in this case when two fundamentally different markets are forced together, and where in one of which market failure arises in two separate areas (lack of competition and wider social value in connecting rural communities). It is also assumed that the auction process will deliver the most efficient use of the spectrum on the basis that the person who pays most for it will be more determined to utilise it. This logic is also flawed since it refuses to recognise the motivation of existing fixed line operators who may well be motivated to secure the spectrum purely to defend legacy assets. This is not an unlikely scenario.

We would also like to set out our specific concerns with ComReg's competition analysis which are relevant both to ComReg's current proposals and our alternative proposals. The main problems arise in chapter 5 of ComReg's Consultation which discusses imposing competition caps in order to promote downstream competition when auctioning 3.6GHz. We do not see how it is possible to discuss and objectively justify interventions to promote "downstream competition" without having first identified the relevant downstream markets.

This problem is also apparent in the report from DotEcon on the design of an award for 3.6GHz[31]. In paragraph 10 of their report they say that it is unlikely that any significant competition concerns could arise as a result of awarding spectrum in the band. However, this is precisely because DotEcon have failed to identify the relevant downstream market for this award. Crucially, DotEcon say that it is too early to judge the form of LTE delivered FWA services and whether they would compete with wireline services in paragraph 104 of their document. This is contradictory to the DAE, NBP and SAG and the evidence in the National Broadband Plan, the Mapping Process that ComReg is supporting and indeed EU State Aid Guidelines.

We note that we provided in our previous response on the technical capabilities of TD-LTE FWA technologies and the EC's recognition that appropriately designed FWA networks can and do provide fixed NGA services. A failure to recognise this is baffling or demonstrates a lack of sufficient scrutiny in the award process thus far. Relying on this flawed assessment would put Comreg in a position of undermining the NBP. We urge ComReg to urgently review this or to state clearly a reason for this omission.

In contrast, DotEcon assert that there may be demand for the spectrum from MNOs in addition to FWA service providers - this on the basis of far less evidence of the potential demand from MNOs. We find this approach subjective and inconsistent with DotEcon's acknowledgement in paragraphs

[31] http://www.comreg.ie/_fileupload/publications/ComReg1571.pdf

26-29 that 3.6GHz is not a good substitute for the lower frequency bands in which MNOs are clearly interested. We also find it inconsistent for ComReg to commission a report from Plum on spectrum requirements for FWA to provide NGA services, but then not to consider or define fixed NGA' as a relevant market.

The result is that the key competition concerns in auctioning the 3.6GHz band are not considered nor reflected in proposals for managing competition – i.e. Whether fixed line operators, e.g. eircom, could have an opportunity to restrict or foreclose competition in the fixed NGA through bidding.

Properly designed advanced LTE services delivered using FWA will compete with fixed line NGA, and indeed may be more cost effective than fixed line solutions in some areas. Therefore, fixed line operators could have an incentive to acquire 3.6GHz spectrum for anti-competitive reasons, i.e. to limit the competitive threat from FWA delivered NGA services (and since they see FWA as having a minimal role in their NGA plans, their legitimate demand for FWA services appears limited). For example, in their responses to the DCENR Mapping Consultation[32], eircom stated "… *the optimal solution to broadband for rural Ireland is predominantly fibre centric and as such, the use of microwave (MW) radio links will be limited*", and "*The situation where eircom may consider the use of MW for fixed services would be for very isolated communities such as sparsely populated islands*", (See Section 10 of **Error! Bookmark not defined.**[33])and Siro[34] (who are branded as a 100% fibre company) unsurprisingly seek to constrain wireless technology ("*We would suggest though that fibre connections are used where practicable and the use of radio is minimised to where fibre is uneconomic*", Section 8 of [34] )

As a result we believe it is essential that proposals for auctioning the 3.6GHz band consider what actions need to be taken to prevent an auction distorting the potential future downstream competition in the fixed NGA market. We discuss this in the next section.

[32] DCENR Responses to Call for Input (SubmissionstoCFIforpublication22ndOctober2014FINAL.pdf)

[33] National Broadband Plan, Public Consultation Submissions 2015. http://www.dcenr.gov.ie/communications/SiteCollectionDocuments/Broadband/Mappingconsultationsubmissions.compressed%20(1).pdf

[34] Siro is the joint venture company formed by ESB and Vodafone to deliver a 100% fibre-to-the-building broadband network. See http://siro.ie/more-about-siro/. This organisation was referred to as ESB/Vodafone Joint Venture Fibre to the Building (FTTB) Company in the Mapping Consultation response.

# 5 Eircom or other fixed line infrastructure operators and the potential for market dominance

If there are no restrictions on the amount of spectrum eircom can acquire in the auction of 3.6GHz, there could be adverse implications for competition in the fixed NGA market and for efficient spectrum use, both of which would reduce consumer welfare.

The worst potential outcome would be if eircom gained more than 250MHz of the 350MHz available in the band, and then effectively hoarded the spectrum, by not using it at all or under-utilising it so as to avoid cannibalising revenues from its own fixed line services, particularly where it had already made substantial investments in fixed line NGA. In addition, since FWA operators would need at least 100MHz to offer NGA services (30Mbps download speeds), no one else would be able to compete with eircom's fixed line NGA services.

This would clearly be inefficient as spectrum would lay idle and would not be put to its most productive use, not only in areas where FWA can compete with fixed line NGA, but critically in some areas FWA might be the only means of delivering affordable NGA services. This could cause considerable harm to consumers.

Consumers would also be harmed because competition in the fixed NGA market would be lower than otherwise. Consumer choice would be reduced but more importantly, prices would be higher for all NGA users. Even small competitors can have a significant impact on pricing when the competitive threat they pose is disproportionate to their actual size as has been observed in many markets for mobile and other services in Europe. The threat to eircom from FWA operators will also put downward pressure on eircom's NGA prices, even in areas where FWA operators are less likely to enter immediately.

It is worth re-iterating our previous input showing that the broadband market in Ireland is lagging when considered against European benchmarks. Last year in the Imagine Response to 14/101 (see[35]) we noted that *"NGA coverage in Ireland at 54% was significantly below the EU average of 62% and even more so in rural areas (6% compared to 18%)".* Updated data from the EC Digital Agenda[36] suggests that Ireland has not significantly improved fixed broadband compared to progress in other European countries in the last year (see Figure 1).

[35] Imagine Consultation Response to ComReg 14/101. Comments on ComReg Consultation: Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands. Non-confidential response at: http://www.comreg.ie/_fileupload/publications/ComReg1515.pdf. Confidential note also provided to ComReg.

[36] Digital Agenda for Europe, Connectivity report, https://ec.europa.eu/digital-agenda/en/connectivity. Accessed August 12th 2015.

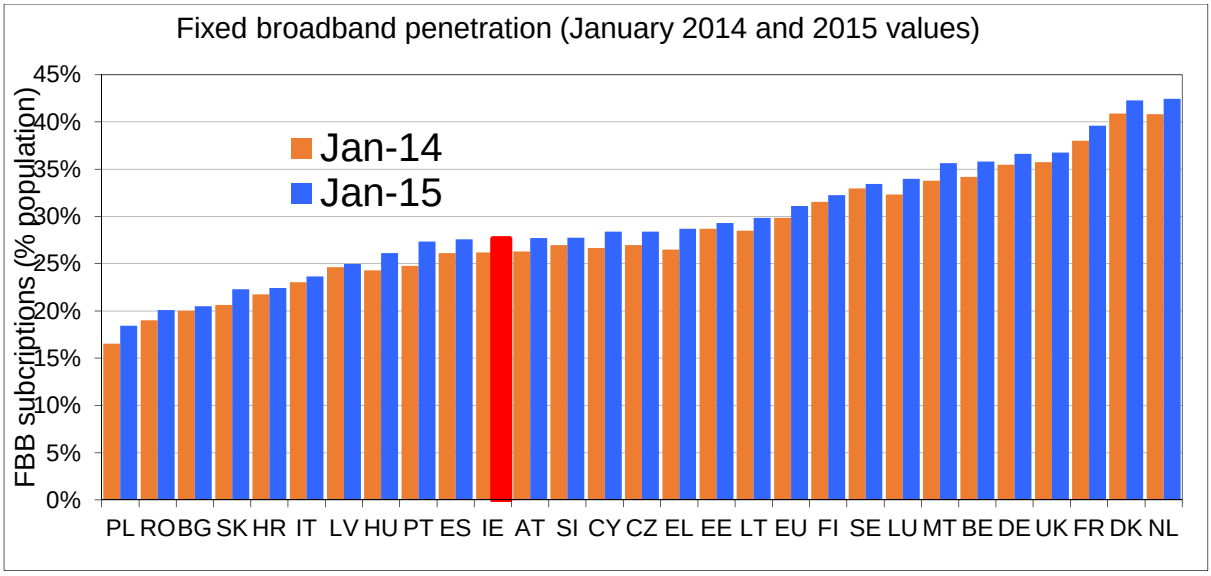


*Figure 1: Fixed broadband penetration (as a % of population) in EU member states in January 2014 and January 2015.*

In the same submission, Imagine commented on the high price to Irish consumers with the existing Fixed Broadband market: "ranked below the EU average for a residential basket of FBB prices taking all speeds at 15th place for speeds above 10 Mbps and 19th place for broadband in general". Updated data from the EU (see Figure 2, and Figure 3) indicates that the situation has not changed.

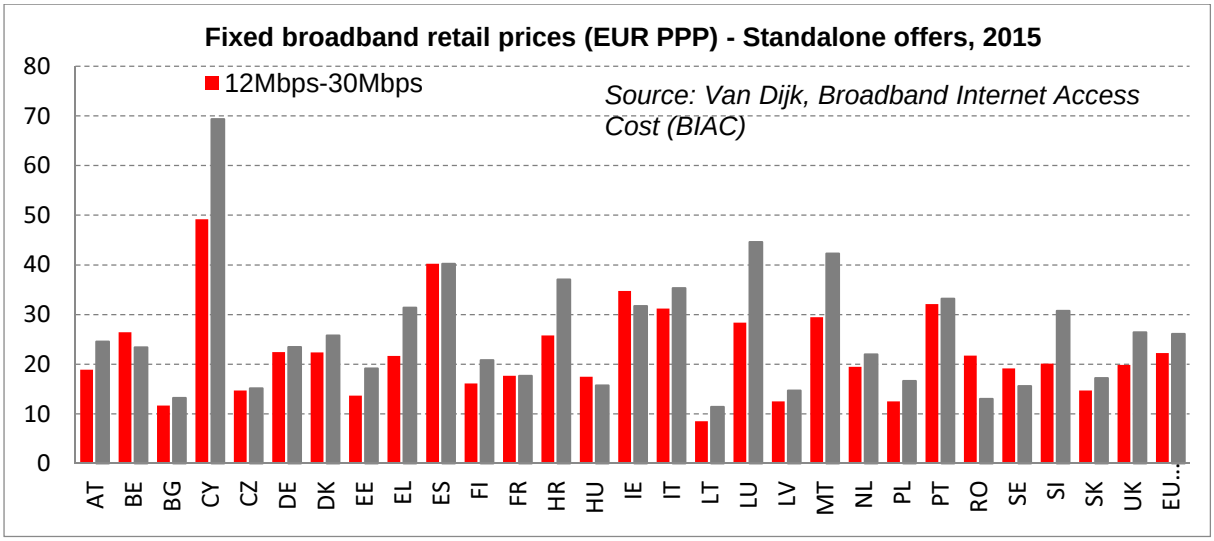


*Figure 2: Fixed broadband prices in Ireland compared to other EU states (Source: Van Dijk – BIAC and EC Digital Agenda Scoreboard 2015[37])*

[37] Broadband market developments. EU Digital Agenda scoreboard reports. http://ec.europa.eu/digital-agenda/en/download-scoreboard-reports

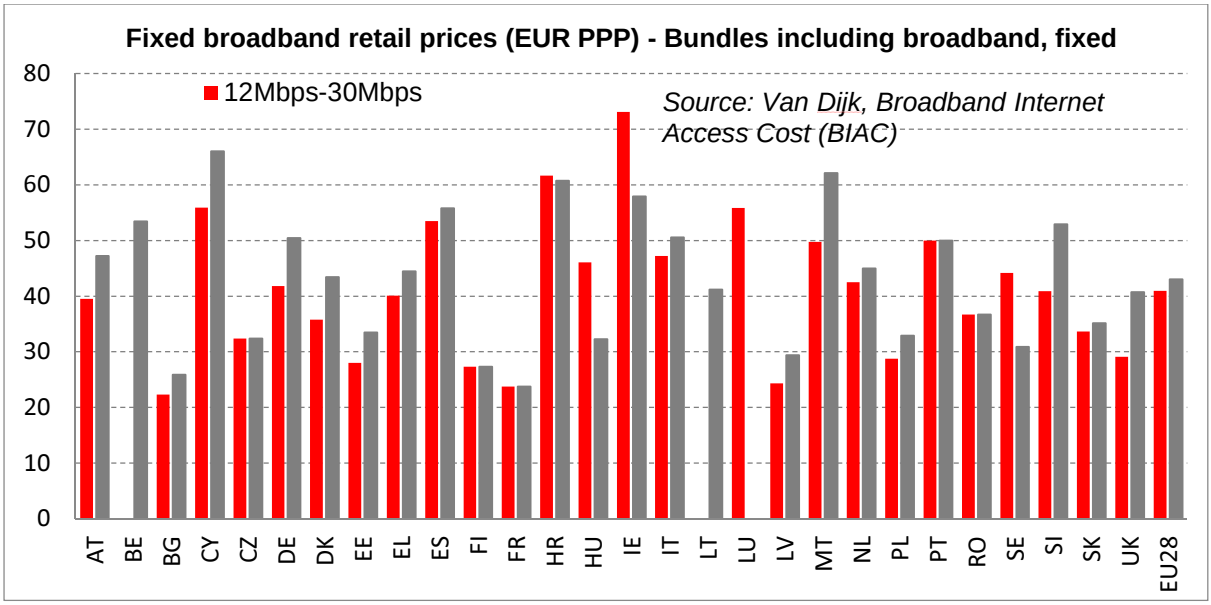


*Figure 3: Broadband and other bundled service prices in Ireland compared to other EU states (Source: Van Dijk – BIAC and EC Digital Agenda Scoreboard 2015)*

Given this further evidence of the relatively poor provision of broadband services in Ireland (which will be worse in rural Ireland) and some of the highest EU cost of service, ComReg needs to consider methods that would encourage sustainable competition in fixed NGA services including alternative and new entrants to the market. Imagine seeks to do this urgently but is prevented in doing so by the delays in the existing process and could be thwarted if incumbents are permitted to exercise their market power to stifle competition.

If ComReg takes on board our recommendations for awarding 3.6GHz for a new NGA entrant, it will have the opportunity to promote fixed NGA competition across Ireland since the provision of an NGA FWA network will boost competition in all areas of the country – not just in the rural areas which will benefit most. ComReg will also have the opportunity to use the 3.6GHz band to help meet government policy of achieving NGA broadband in every home by 2020 and reduce the amount of state subsidy need to do so.

# 6 Considering the market for fixed NGA

As noted in the consultation document[38] ComReg has to "take into account the national objective regarding broadband rollout, in that 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". As noted in previous Imagine responses, Imagine strongly believe that the 3.6GHz band has a key role to play in permitting the cost-effective delivery of the National Broadband Plan to Ireland's large rural population, in particular. Imagine has even provided DCENR with concrete business plans and evidence of financial backing for its own FWA NGA network. Despite this, the spectrum packaging seems to be driven by the unclear, undefined and subjective needs of mobile broadband, rather than the needs of the only certain relevant market, fixed NGA which has been recognised in the EU's DAE, the NBP and the DCENR intervention accepting FWA as part of its programme for subsidised NGA rollout.

It is highly relevant that in its assessment Dot Econ and Comreg ignores the views of the actual mobile operators who would apparently will have demand for this spectrum who clearly see no use for mobile and a specific use for FWA. In response to the previous consultation Vodafone (see pp6 of Vodafone response to ComReg 14/101 in ComReg 15/15) noted that "propagation characteristics at 3.6GHz make this spectrum significantly less suitable for true mobile applications" and that "The likely primary applications are FWA and non line of site transmission links to small cells". In the same document 3 Ireland (pp7 of their response) note that the 3.6GHz band "would have limited value in Ireland for mobile services. With little or no mobile device inclusion this band stands in a different category to the others covered by ComReg's consultation".

In addition they ignore the views of a global infrastructure and equipment supplier. Huawei note (see page 1 of their response) "We do believe that 3.6GHz LTE is an ideal spectrum band for FWA, and that the use of 3.6GHz LTE FWA for delivery of broadband services in Ireland is realistic to decrease the cost for fixed line engineering, especially in rural areas and some high capacity urban indoor area, and that the use of BAND 42/43 LTE TDD should be encouraged for FWA".

Plum have assessed the spectrum requirements of a FWA network in three different environments (urban, suburban and rural) and have concluded that "a total of up to 80MHz would be required by a single network to cater for a future high speed wireless broadband service compatible with the DAE 30 Mbps target, based on current FWALA infrastructure density and market share (4% of the total broadband market). This estimate is also based on the assumption that there would be a single wireless operator in each area." This pessimistic view is drive by the inappropriate and inaccurate of the decline in use and demand for FWA dealt with earlier. Imagine in line with the NBP anticipate rolling out a higher capacity network using a minimum of 160MHz of spectrum

In their analysis, Plum also consider the requirements of providing service to 50% of dwellings in rural Donegal, suggesting that "fixed wireless network configured to deliver coverage to all of the populated areas of Donegal, having access to 100MHz of spectrum and sufficient fibre backhaul

[38] Policy Direction No.3 on Broadband Electronic Communication Networks.

capacity would be capable of serving up to half the population with a high speed broadband service." We note that both ComReg's own consultants (Plum) and Huawei note that FWA can be a competitive method of providing NGA services.

Imagine's own analysis has found that a high capacity NGA FWA network to deliver much needed NGA services and to help achieve the NBP would benefit from use of more spectrum than suggested by Plum (100MHz) and would like to see ComReg consider making this a key consideration of the spectrum lots that are being considered. Imagine suggest that a minimum of 160MHz (rather than ComReg's suggested lower end of 150MHz) be set aside for Fixed NGA service delivery in appropriate lot given the likely use of 20MHz channels.

# 7 Auction award mechanism

A key part of ComReg's Consultation is the Draft Regulatory Impact Assessment in chapter 3 of the current Consultation. In our view and for the reasons set out in this response, the draft RIA is weakened from the outset by the failure to determine the relevant market. Because ComReg has not identified the relevant market, its analysis is subjective and ultimately erroneous. We consider that fixed NGA' is the relevant market and that the potential, uncertain and undefined future mobile broadband usage should carry little weight.

However, in a number of cases ComReg's proposals have been overly influenced by potential MNO use. This has been justified by a subjective and overly optimistic assessment of MNO demand for 3.6GHz. However, as we said in our response to the 2.6GHz Consultation, *"Mobile demand for the [3.6GHz] band is highly uncertain …, hence the potential efficiency benefits from satisfying future MBB are intangible and speculative."*

Further, ComReg's analysis of the potential usage and demand for the 3.6GHz band for mobile services is contradictory. In *paragraph 3.52* ComReg appears to view 3.6GHz and 2.6GHz alike as "'performance' or capacity bands" for MNOs. In other places, such as paragraph 5.71 it emphasises that the potential MNO demand for 3.6GHz to provide capacity using small cells is some way off in the future. In addition ComReg's analysis contradicts and is unsupported by the main mobile operators in the market.

ComReg's rejection of administrative assignment is largely predicated on the supposed views of MNOs and unidentified prospective new entrants for which no evidence is provided and contradicts the views of the main MNO's in the previous response to consultation and its failure to recognise its obligation to prefer Fixed NGA services in the use of the 3.6GHz spectrum given the wider considerations that arise in the context of the proposed market intervention envisaged as part of the NBP.

Additionally, most MNOs and vendors agree that, currently, there is no mobile demand for the spectrum and little in the way of an ecosystem. The recent auction in the Czech Republic also reinforces this conclusion. In our view, ComReg has given undue weight in the proposed auction design to mobile given that even ComReg acknowledges the uncertain and future nature of mobile demand.

Another example, the minimum pricing approach - although it makes reference to current FWALA fees - is based upon benchmarking with bands used for mobile broadband. The justification for this is not convincing given the uncertainty of mobile broadband use in 3.6GHz. However, DotEcon's figures for ComReg support the view that there is currently no mobile demand for the 3.6GHz band and that basing minimum pricing on these other bands seems unreasonable given the uncertainty in demand and variability in pricing that is evident. As part of their analysis to identify reserve prices of an auction award process, DotEcon presented benchmark figures for average licence fees in all bands, 2.3, 2.6 and 3.6GHz band, as shown in Figure 4.

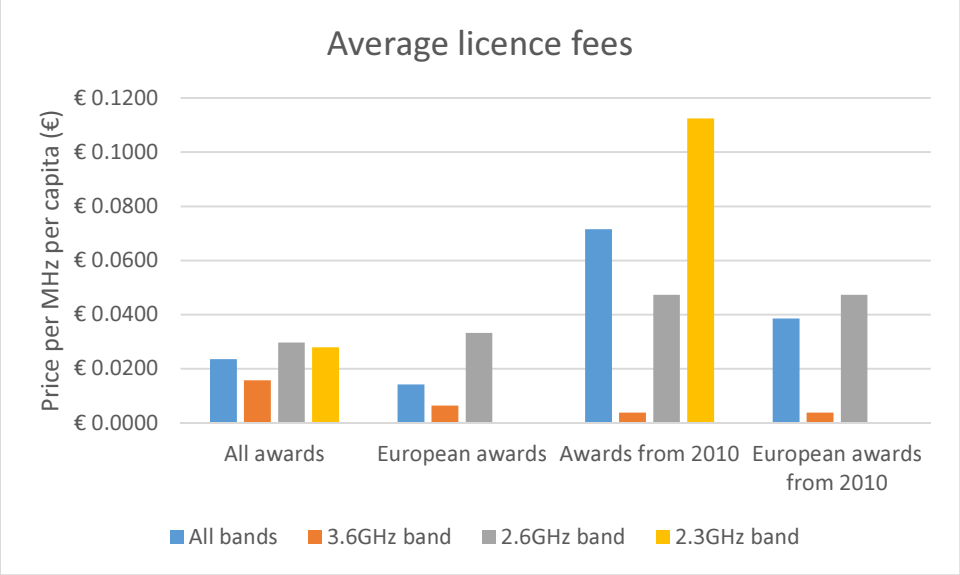


*Figure 4: Benchmark licence fees of different spectrum bands (taken from DotEcon report to ComReg)*

These data clearly indicate that the 3.6GHz band have been valued significantly lower than other bands in general and the 2.6GHz and 2.3GHz bands in particular, though no data was available for European awards from 2010. In our previous submission Imagine identified that the 3.6GHz band was not suited for mobile use and mobile operators in responding to ComReg have noted that their do not believe that the 3.6GHz band is substitutable for other bands. Despite this, DotEcon fall back on the totally unsubstantiated claim and highly subjective and speculative view that *"bidders in prior awards are unlikely to have factored in future migration to LTE when valuing spectrum" to support their assertion that "3.6GHz benchmarks may underestimate the current market price".*

**On the basis of the above not only is the basis on which Comreg rejected the Administrative Award approach no longer valid but it is in fact the most appropriate process to deal with the actual demand in the market and to ensure effective competition in the relevant market. It is also the appropriate award approach to ensure timely and effective NGA competition in line with the objectives of the NBP and for compliance with the SAG on State Intervention.**

# 8 Risk of inefficient outcomes due to a bias towards mobile at expense of fixed NGA

It is possible that MNOs could have a case for use of 3.6GHz for mobile broadband capacity at some point several years in the future, though this is highly uncertain. This is one of the reasons why ComReg rejected reserving even part of the 3.6GHz band for FWA.

ComReg also proposes setting minimum prices with respect to the price paid for spectrum that has been acquired for mobile broadband services.

We believe that too much weight has been given to mobile broadband use given the uncertain and potentially far off nature of that demand. This could lead to inefficient outcomes from the spectrum auction as currently designed.

As a direct consequence of the proposed auction approach , that there is a risk that MNOs overestimate the future speculative value of 3.6GHz (e.g. compared to other resources that may be available in the future), to the extent that it increases what they are willing to pay over and above what FWA operators are willing to pay. In this case the spectrum could lie fallow for many years, until at some future point it is traded or handed back for re-assignment. Not only would this have reduced the benefits that FWA could deliver to consumers in terms of the quality of services but also the extent of competition to fixed line NGA services in the meantime. The opportunity for FWA to compete with fixed line NGA may have passed never to be recaptured.

MNOs' valuations of the spectrum might also exceed the true or intrinsic value as a result of strategic bidding. Given the level of uncertainty over future MNO demand, MNOs may have very different valuations of the spectrum. However, the desire to avoid being at a future competitive disadvantage may artificially increase MNO demand for the spectrum. Although this would be a legitimate concern for MNOs, it could mean that their valuations are higher than the intrinsic value of the spectrum to them because of such strategic reasons. This would have a similar effect on the quality of FWA services and the extent of competition to fixed line NGA services as before.

Proposed measures on undefined future caps on 2.3 and 2.6GHz allocations and minimal rollout commitments are insufficient and inadequate to dissuade this.

# 9 Options for promoting competition in fixed NGA

**Reservation of spectrum for FWA**

ComReg has an obligation to promote allocation of 3.6 GHz spectrum for FWA NGA services. This is also the only current and credible demand for the spectrum and FWA operators – particularly Imagine - have demonstrated a willingness to invest by giving commitments to the government as part of the NBP mapping process and this willingness to invest has been communicated to ComReg. The optimum use of the spectrum is fixed NGA which is the only relevant market. FWA also has an important role to play in delivering the government's NBP objectives competitively and cost effectively.

Imagine in consideration of the reasons set out in this response believe that a solution exists that can reconcile all issues in line with ComReg's Obligations and allow ComReg to assist DCENR in meeting the State's NBP and SAG obligations, and improve competition at retail and wholesale level for NGA broadband for consumers.

**We strongly recommend that for the reasons set out in this response and following a full consideration by Comreg of the relevant NGA market that an Administrative Award for a National licence to deliver NGA services is the most appropriate process to deal with the actual demand in the market and to ensure effective competition in the relevant market. It is also the appropriate award approach to ensure timely and effective NGA competition in line with the objectives of the NBP and for compliance with the SAG on State Intervention.**

We propose that ComReg:

- Release the 350MHz of spectrum as two classes of Licence (A-type and B-type) with different conditions
- The A-type licence would be a National Licence of a minimum of 160MHz of spectrum and would have specific conditions ensuring a rapid national NGA rollout of a network that can support open, wholesale access of fixed NGA services across the country. This would encourage NGA competition in both infrastructure and at a retail level and support the National Broadband Plan
- The B-type licences would consist of lots from the remaining 190MHz of spectrum and have less restrictive rollout conditions, and would be awarded under conditions broadly similar to the approach that ComReg is currently proposing which allows mobile operators to consider their value for the spectrum given their unlikely, but conceivable, future demand for the spectrum.

This approach recognises the significant importance of NGA in the context of the NBP. Notwithstanding the lack of evidence to support mobile as a relevant market for the 3.6GHz band, this allows the market scope to resolve the uncertainty over future mobile broadband demand, while avoiding uncertain future mobile use or protectionism from potentially distorting the auction process. Hence, the auction will be able to deliver the full benefits of FWA including better provision

of rural NGA and increased fixed NGA competition. This two licence class approach has been used previously in Ireland and elsewhere to achieve competitive, social economic benefits, for example, to boost competition in Ireland at the release of the 3G mobile spectrum[39] and in the UK 3G auction which saw the disruptive and innovative entry of Hutchison 3G into the UK market. It is particularly useful in attracting new infrastructure investment.

The Type-A licence should be awarded as part of an administrative award process with rollout conditions in terms of the Rate, Scale, Technical Performance, geographic deployment etc. aligned with the NBP objectives and in advance of the implementation of the NBP. The B-type licences can be awarded broadly in line with the current approach with some amendments to reflect the different use.

This is the optimal use of the spectrum, consistent with the market expectations of consultation respondents and is in line with ComReg's obligations. This approach will best serve the market and customers and will minimise the need for state intervention by enabling commercial network deployment over a wider area than is supported at present.

We suggest that that the rollout conditions would be significant and for comparison to the Comreg approach on base stations would be.

- Type-A Licence
    - Minimum roll-out obligations to include
        - [redacted] within [redacted] year of the spectrum award being finalised.
        - [redacted] within [redacted] years of the spectrum award being finalised.
        - [redacted] NGA compliant Base Stations activated and supplying services within [redacted] years of the spectrum award being finalised.
        - [redacted] NGA compliant Base Stations activated and supplying services within [redacted] years of the spectrum award being finalised.

In addition to the commitment to a total number of base stations deployed commitments could be required to provide an NGA compliant service in all 26 counties

- Type-B Licence
    - ComReg can proceed as it outlined in its approach to set lower roll-out conditions for this category of licence as it sees fit.

The B-type licences would consist of the remaining 190MHz of spectrum and have less restrictive rollout conditions, and could fit in with the approach that ComReg is currently proposing to accommodate the uncertain, future demand from mobile.

However, we would comment that setting a minimum rollout commitment, as discussed by ComReg in section 6 of the Current consultation, has little meaning if it is applied to two very different applications – and mobile capacity. Instead, logic should dictate that coverage conditions for the B-type licence should still preference the relevant market, 'Fixed NGA' but with alternative uses permitted. Additionally, the roll-out obligations proposed by ComReg are minimalist and will give

[39] See http://www.comreg.ie/_fileupload/publications/odtr0196.pdf.

the long period ComReg propose to allow to meet these conditions it could lead to market stagnation for years to come. Roll-out commitments should be more aggressive and measured on a much shorter (annual) timeframe if they are to have any meaningful impact on the market and deter strategic bidding.

For the A-type licence - and for the B-type licences if they are acquired for FWA in the auction - there is another mechanism that can address the uncertainty over future mobile demand. If in the longer term, 3.6GHz does become valuable to mobile operators it is most likely that this will occur in the urban areas and they should be able to go to the secondary market to acquire spectrum. This should be more than sufficient to promote the efficient use of the spectrum in future. ComReg does not need to attempt to design an auction that can cater for every possible potential future use of the spectrum. Spectrum trading has been active in a number of EU Member States for some time now[40].

In addition the award of an A licence with the condition of open wholesale access would significantly reduce the risk to smaller Wireless Operators of being forced out of business and the very complex issues being considered by ComReg under the current proposed Auction where there is uncertainty of NGA allocation. This would greatly reduce the complexity of "Transition" arrangements providing a fixed to fixed transition. This is discussed below in more detail. Imagine would be proposing an agreed transition plan to facilitate existing operators.

**Precedents for promoting FWA usage in 3.6GHz**

We believe that, in addition to the obligation already detailed, there also are good precedents for promoting the allocation of 3.6GHz to FWA, even though there have not been many 3.6GHz award processes since it has been possible to use LTE technologies in the band.

First, as we noted in our previous submission, Ofcom decided to renew the 3.4GHz licence of UK Broadband because it wanted to expand choice and promote valuable competition in the UK fixed broadband market and to promote sustainable and increased investment in the UK. Although Ofcom is auctioning other spectrum in the 3.4GHz band on a service neutral basis, it has effectively reserved spectrum to allow at least one FWA NGA service provider to be established.

As a result, the UK Broadband decision is really about allocating spectrum for FWA services, in order to promote competition and investment. The mechanism of making the licence indefinite (which ComReg uses to dismiss Imagine's previous response on this issue in paragraph 4.126) is merely the means Ofcom had chosen to achieve these objectives, in the wider context of the 3.4GHz auction. Hence, we reiterate that Ofcom's approach to the 3.4GHz auction is a good precedent for ComReg to intervene to ensure that FWA operators can use 3.6GHz to provide competitive fixed NGA services. Moreover, the competition benefits from promoting FWA are likely to be substantially higher in Ireland than in the UK. The services targeted in Ireland, fixed NGA, are higher value than the basic broadband services targeted in the UK and the scale of the opportunity and need is larger because a higher proportion of the Irish population lives in rural areas and the clearly acknowledged existence of the digital divide.

[40] http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP169.PDF

Second, the Czech regulator, CTU, is proposing to auction the 3.7GHz band. Their proposals support our view that the relevant downstream market for this band is 'Fixed NGA' and add to the precedent for preferring FWA use in the 3.6GHz auction as opposed to mobile. The auction will play a key part in their national broadband strategy and they are proposing to reserve spectrum for a new entrant to deliver 'Fixed NGA' services, i.e. 30Mbps download. Plum, in their technical advice to ComReg concerning potential rights of use in 3.6GHz[41], say that this spectrum has been earmarked for "high speed mobile electronic services". However, our research suggests that while mobile operators will be able to participate in the auction, the provision of national broadband Internet services appears to be the main goal. Indeed demand, to use the spectrum for mobile broadband services seems to be as low and uncertain in the Czech Republic as it is in Ireland since Czech MNOs requested that the auction be postponed to the long term[42].

**Spectrum caps in other bands**

In addition to our main proposals we note the following. ComReg has rightly identified a mechanism to partially address the uncertain and future competition issues that could arise in the mobile market. *Paragraph 5.72, on competition caps for MNOs states "At the same time, ComReg observes that, for certain uses, the 3.6 GHz band may, over time, become more substitutable for other "mobile bands" - the 2.3 GHz and/or 2.6 GHz bands in particular. Accordingly, ComReg notes that 3.6 GHz holdings obtained under this award process may be taken into account for a competition cap of the award of sufficiently substitutable spectrum bands (for example, 2.3 and/or 2.6 GHz) and ComReg welcomes views from interested parties on this issue."*

We urge ComReg to give a strong signal of intent to implement such caps in the award of 2.3 and 2.6GHz and to assess at what level such caps could be set. If ComReg does not indicate the potential level of these caps, MNOs will be exposed to a substitution risk in the auction.

# 10 Need for a fast decision

Imagine urges ComReg to reach a clear decision soon on the approach to awarding this spectrum. The uncertainty over Imagine and other FWA operators' access to this spectrum has a negative impact on the ability to secure full funding for investment and will have a negative impact on the NGA market and the NBP.

At the very least, continued uncertainty will delay Imagine's ability to deploy network and service to consumers, denying the Irish economy of the benefits of increased broadband use.

'Fixed NGA' is the relevant market and FWA can serve that market as clearly acknowledged by the EU and in the government process to subsidise the rollout of NGA services in rural areas to help achieve the NBP and extend the benefits of NGA to the whole market.

Lack of clarity on licensing and availability of the 3.6GHz band is impeding commercial deployment and rollout and it impedes the DCENR mapping process for subsidised NGA rollout. If this is not

[41] http://www.comreg.ie/_fileupload/publications/ComReg1574.pdf

[42] http://www.telecompaper.com/news/ctu-evaluates-comments-on-3600-3800-mhz-auction-rules--1036879

resolved quickly commercial FWA rollout may be affected which will increase both the size and number of areas that require state intervention.

Quickly developing an award process that recognises fixed NGA as the relevant market and ensures that at least one operator will be in a position to deploy FWA is critical to ensuring that FWA will be included in the tender process for the NBP.

# 11 Response to Questions

## 11.1 Chapter 4

### 4.5 Chapter 4 Consultation Question

4.147 Do you agree with ComReg's preliminary views set out in Chapter 4 and, in particular, that:

- the band plan for the 3 400-3 600 MHz sub-band should be TDD (in line with the preference expressed in the 3.6 GHz EC Decision);

Imagine agree that the 3400-3600 MHz sub-band should be TDD in line with the preference expressed in EC Decision 2014/276/EU47 on the harmonisation of the 3.6 GHz band (the —EC 3.6 GHz Decision).

- regions should be established in line with the principles identified by ComReg;

As set out above we believe it is essential to ensure effective competition that a single National licence is awarded "A Licence". In relation to the proposed "B Licence, the establishment of Regions appears a sensible approach given that ComReg are cognisant of different potential markets, with different dynamics and different potential spectrum uses. We agree that the main urban conurbations should be contained within separate Regions since those seem the areas most likely to be of some interest (however small) to MNOs. However it must be clearly recognised that there are significant white areas within the urban conurbations where NGA service will not be provided by existing operators. This can be as much as 10% of the market. As a wholesaler of existing NGA services there are many customers who simply cannot and will not get NGA on existing networks. NGA FWA has a key role in servicing these customers. If the A Licence approach recommended is awarded this would ensure these customers are serviced.

I t is of clear importance that the definition of Regions outside of the main urban conurbations should align completely with those Regions envisaged to be created under the NBP. To not align these Regions is inefficient and will give rise to avoidable complexity as one 'region' overlaps another. There is no clearly articulated logic for the formulation of regions that do not align with those of the NBP and many obvious reasons why it is highly preferable that they are aligned. We strongly urge ComReg to liaise with DCENR and agree a common approach to these regions.

- the regions identified in Option 2 should be used for the proposed award; and

Redefined regions as outlined in our response above should be those used in the award process.

- a licence duration of 15 years should apply to the 3.6GHz band.

DCENR have indicated that the likely duration of contracts awarded under the NBP will be for a term of 20 years. For obvious reasons it is clearly preferable that the durations of spectrum awarded (and consequently used for FWA NGA) should be retained for the same duration as any potential NBP Contract. In fact, to consciously not synchronise these durations will actively discriminate against

FWA in an NBP Tender process and will lead to difficulties including concerns regarding compliance with State Aid Guidelines and mandated EU procurement processes. We urge ComReg to ensure that the duration of spectrum award is at least 20 years.

In this regard it is also essential that consideration is given to the extension of these licences beyond 20 years to avoid conflict with the NBP Intervention.

### 11.2 Chapter 5

**5.10 Chapter 5 Consultation Question**

5.146 Do you agree with ComReg's preliminary views set out in Chapter 5 and, in particular, that:

- a combinatorial clock auction is the preferred auction format;

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed.

No. We do not agree that a CCA auction is the preferred award format. For reasons detailed in this (and earlier) responses we believe that the proposed CCA award format is inappropriate in the context of diverse usage and market demands and economics and potentially not in compliance with EU obligations under SAG. We believe that the licences should be awarded in two distinct categories:

For the reasons set out earlier

- The Type-A licence should be awarded as part of an administrative award process with rollout conditions in terms of the Rate, Scale, Technical Performance, geographic deployment etc. aligned with the NBP objectives and in advance of the implementation of the NBP.
- The Type-B licences can be awarded broadly in line with the current approach with amendments to reflect the different use. The B Licence can be awarded under an appropriate auction format and CCA auction format is acceptable for this licence if the obligation to prefer Fixed NGA in spectrum use is met with the Type-A licence.

- a single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz;

Imagine do not agree that a single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz and that it should be allocated in the same way as the rest of the available spectrum in this band.

- Sixty five (65) frequency-generic lots of 5 MHz each should be adopted for frequencies between 3475 MHz – 3800 MHz;

Imagine believes that whilst it would be preferable to assign the spectrum in 20MHz blocks it will be necessary to allocate in lots of 5MHz each to ensure that it is possible to allocate the entire band with no unused 5MHz blocks.

- a competition cap should be set and, further, that such a cap be within the range of 150 MHz to 250 MHz ComReg is mindful of the alternative uses to which this spectrum can be put and the potential impacts this can have on competitive dynamics in the relevant market concerned (for example fixed of mobile). Accordingly, ComReg welcomes input on any other factors which should be taken into account when establishing the level of any competition cap;

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed.

The analysis by Plum is inaccurate

In the Plum report 15-75, section 3.2.6 where they outline their approach to determining the sufficient amount of spectrum required to provide a reasonable level of service they first calculate a spectrum efficiency of 87Mbps / 20MHz = 4.35bps/Hz.

Plum then go on to state the following: *"LTE technology incorporates advanced scheduling and interference management capabilities that enable a single frequency re-use factor to be deployed, i.e. the same radio channels can be deployed on all base station sectors. This helps to maximise capacity and spectrum efficiency by enabling all an operator's available radio spectrum to be used at all locations in the network."*

Whilst Imagine agree that the technical capability exists to enable single frequency re-use in LTE networks the difficulty with such an assumption is that in Plum's subsequent analysis where it appears that a single frequency reuse is assumed it fails to take proper account of the reduction in sector throughput that results from such a reuse configuration. Depending on the exact deployment conditions (e.g. cell density, terrain, etc.) the reduction in sector throughput from a single frequency reuse can range from 50% to 90%.

Imagine's own tests on TD-LTE have shown that sector throughput can reduce by up to 50% when an adjacent sector on the same frequency is introduced. Other studies have shown that throughput for a frequency reuse of 1 reduces cell capacity to 1/10th of its original capacity for example refer to: Celplan document "4G Technologies Myths and Realities". By not taking this into account the Plum report significantly underestimates the amount of spectrum required to provide a reasonable level of service. The consequential impact may be an increase in capital expenditure which in marginal population density areas may make such investments uneconomic thus reducing the ability of the commercial sector to serve the largest number of customers without the requirement for state subvention.

Whilst the 87Mbps stated by Plum is broadly in line with Imagine's own estimation of an average throughput of a 20MHz sector (84Mbps), However, Imagine's figures are based on LTE-A deployed as a fixed wireless network and incorporates factors such as MIMO gain to achieve this figure. FWA involves many LoS paths so interference occurs over much bigger distances than in MBB, hence the need for proper reuse planning. It also requires the delivery of assured data rates under contention conditions which is not the case in MBB.

Based on an LTE-A FWA network deployment with appropriate reuse planning and considering the requirements for assured data rates as well as future increases in usage demand Imagine would be of the view that a cap of at least 160MHz is required in order to ensure that at least one operator has a sufficient amount of spectrum to provide a reasonable level of services not just in the short term but over the full term of the licences. This is consistent with our recommendation on the Award of an A licence.

While the availability of additional spectrum up to 240MHz would facilitate more efficient capacity infill on existing mast locations versus additional and distributed base stations to meet capacity demand and future performance advancements, under the current proposed Comreg Auction award

there would be significant risk of market distortion if one operator not deploying NGA secured this spectrum position.

- benchmarking be used as the approach by which to determine a conservative minimum price;

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed.

ComReg's minimum pricing approach, although it makes reference to current FWALA fees, is based upon benchmarking with bands used for mobile broadband. The justification for this is not convincing given the uncertainty of mobile broadband use in 3.6GHz.

However, DotEcon's figures for ComReg support the view that there is currently no mobile demand for the 3.6GHz band and that basing minimum pricing on these other bands seems unreasonable given the uncertainty in demand and variability in pricing that is evident.

Setting minimum prices risks pricing out FWA operators who want to compete in the relevant market which is 'Fixed NGA'.

MNOs' valuations of the spectrum might exceed the true or intrinsic value as a result of strategic bidding. Given the level of uncertainty over future MNO demand, MNOs may each value the 3.6GHz very differently. However, the desire to avoid being at a future competitive disadvantage may artificially inflate the amount that MNOs are willing to pay for spectrum as seen in some of the European 3G auctions. ComReg's auction design does not guard against the risk that FWA providers are priced out of the market by excessive valuations on the part of the MNOs.

- the minimum price should be apportioned on a 50/50 basis between an up-front payment (SAF) and ongoing annual payments subject to CPI index linking (SUFs); and

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed.

Since the primary objective is to use the spectrum efficiently and to service the urgent and clearly identified needs of an underserved segment of the population it is more desirable that capital is deployed to deliver network service to customers. It must be borne in mind that the reason there is such a persistent and accentuated digital divide in Ireland is largely because of the difficulty in justifying capital deployment to serve marginal population densities. For ComReg to add to the effective capital cost of network deployment by requiring 50% of such spectrum costs up front is contrary to the best needs of the citizens, contrary to ComReg's obligations under SAG and does not support the delivery of government policy in the form of the NBP. It is much more appropriate that such fees as are ultimately determined as appropriate for the delivery of NGA services be paid to ComReg in line with the utilisation of the spectrum and in line with the number of customers who can access the NGA services. This is of course subject to the roll-out obligations associated with the A Licence and gives ComReg surety of payment but is better aligned with maximising the benefits to the nation by removing an unnecessary burden from operators who are attempting to maximise

commercial investment in underserved areas. We urge ComReg to stage licence payments in line with usage and subject to the minimum roll-out requirements associated with the licence award.

In order to promote rapid deployment and maximise early investment in infrastructure to deliver much need Fixed NGA services in parts of the country currently without such services and to support the objectives of the National Broadband Plan Imagine believes that it is inappropriate to apportion the costs on a 50/50 basis between SAF and SUF.

Imagine propose that the upfront access fee should be no more than 20% of the minimum price and that based on Imagine's proposal for Type A and Type B licences and in line with the precedence set in the original 3G Auction (refer to ODTR 01/96) Imagine believes that the Spectrum Access fee should be payable in a deferred structure that takes account of the market conditions for the deployment of an NGA compliant fixed network deployment whereby the total access fee payment of 20% is split into a smaller upfront fee. The remainder of the minimum price i.e. the Spectrum Usage Fee should be spread evenly over the period (20 years) of the licence.

- the range €0.015 to €0.025 per MHz per capita is appropriate for the setting of the minimum price, with the higher end of the range applying to urban areas and the lower end applying to regions that do not have specific urban areas identified.

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed.

As part of their analysis to identify reserve prices of an auction award process, DotEcon presented benchmark figures for average licence fees in all bands, 2.3, 2.6 and 3.6GHz band.

This data clearly indicates that the 3.6GHz band has been valued significantly lower than other bands in general and the 2.6GHz and 2.3GHz bands in particular, though no data was available for European awards from 2010.

In our previous submission Imagine identified that the 3.6GHz band was not suited for mobile use and mobile operators in responding to ComReg have noted that they do not believe that the 3.6GHz band is substitutable for other bands. Despite this, DotEcon fall back on the totally unsubstantiated claim that "bidders in prior awards are unlikely to have factored in future migration to LTE when valuing spectrum" to support their assertion that "3.6GHz benchmarks may underestimate the current market price".

ComReg also proposes setting minimum prices with respect to the price paid for spectrum that has been acquired for much more profitable mobile broadband services.

We believe that too much weight has been given to potential mobile broadband use given the uncertain nature of that demand. This could lead to inefficient outcomes from the spectrum auction as currently designed.

There is a risk that MNOs overestimate the future value of 3.6GHz (e.g. compared to other resources that may be available in the future), to the extent that it increases what they are willing to pay over and above what FWA operators are willing to pay. In this case the spectrum could lie fallow for many years, until at some future point it is traded or handed back for re-assignment. Not only would this reduce the benefits that FWA could deliver to consumers in terms of the quality of services that could be provided to consumers but also the extent of competition available to fixed line NGA

services in the meantime. The opportunity for FWA to compete with fixed line NGA may have passed never to be recaptured.

MNOs' valuations of the spectrum might also exceed the true or intrinsic value as a result of strategic bidding. Given the level of uncertainty over future MNO demand, MNOs may have very different valuations of the spectrum. However, the desire to avoid being at a potential future competitive disadvantage may artificially increase MNO demand for the spectrum. Although this may be a legitimate concern for MNOs, it could mean that their valuations are higher than the intrinsic value of the spectrum to them because of such strategic reasons. This would have a similar negative effect on the quality of FWA services and the extent of competition to fixed line NGA services as before.

We consider that fixed NGA' services is the relevant market and that any analysis based on possible requirements and use by mobile broadband providers should not be considered.

In the DotEcon report[43] The minimum price proposed, for non-urban areas at €0.015 per MHz per capita is more than double the European average and for urban areas almost four times the European average for the 3.6GHz band. There is no justification provided as to why operators in the Irish market might value 3.6GHz spectrum at 2-4 times the European average. Such high pricing for this spectrum is not only unjustified but likely to prevent the use of the 3.6GHz band from being used to enable delivery of NGA services to customers and to increase competition in the Fixed NGA market. We also note that while ComReg reference the recent 3.6GHz award process in Romania the pricing which is considerably lower than that proposed by Comreg and DotEcon does not appear to have been considered in the analysis.

- the population of each of the regions under Option 2 should be adjusted to take account of the commuter flows between the five identified cities and the other applicable regions.

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed. We do not agree as yet again this is a mobile centric concept and will have a separate bearing on mobile versus fixed usage.

[43] Comreg 15/72 Report from DotEcon on 3.6 GHz band reserve prices.

### 11.3 Chapter 6

**6.8 Chapter 6 Consultation Question**

6.142 Do you agree with ComReg's preliminary views set out in Chapter 6 and, in particular, that:

- the band should be released on a service- and technology-neutral basis;

Imagine agree with this proposal subject to the Proposed approach to issue a separate A Licence

- rights of use in the band should be awarded on a non-exclusive basis;

Imagine agree with this proposal as it is mandated by EU Policy: - Article 4 of Directive 2002/77/EC (Competition Directive)

- an obligation to notify of the termination of a technology should apply;

Imagine agree with an obligation to notify of the termination of a technology however Imagine propose that the notice period for services on pre-existing technology that transition to new licences should be based on the existing service contracts. Imagine also propose that the notice period could be substantially reduced to 30 days if the operator is able to transition customers to an equal or better service. At most 3 months notice is the maximum that should be required.

- a rollout obligation should apply for spectrum rights of use in this band and that such an obligation should be based on a minimum number of base stations to be deployed per sub-national region;

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed.

Imagine agree with the proposal to adopt a rollout obligation based on a minimum number of base stations to be deployed.

There is sufficient FWA LTE –A equipment and CPE vendor choice available to enable a rapid rollout now of much needed fixed NGA services. Whether it is deemed mainstream or not in 2020 does not affect an operator's ability to commit to a more rapid deployment schedule which will use the spectrum more efficiently.

The complete lack of Mobile equipment and CPE vendor choice completely undermines the view of mobile demand and actual usage in the delivery of services in the coming years.

In sections 6.51-6.58 ComReg outline their proposal for rollout obligations based on the following objectives:-

- minimum rollout necessary to ensure the timely and efficient use of spectrum
- to set out the minimum number of base stations that a licensee would be required to deploy in a licence area.

- to have a geographic element requiring licensees to deploy base stations in a number of distinct areas within the licensed area.
- either asymmetric obligations between regions or symmetric obligations that could be based toward the lower end of the range.

ComReg's initial proposal for the extent of any base station rollout obligation is as follows:

- for each of the non-urban regions: the deployment of network controlled base stations at 15 to 25 sites and that these sites should be located in 3 to 5 different counties within the region;
- for the Dublin region: the deployment of network controlled base stations at 15-25 sites; and
- For all other urban regions: the deployment of network controlled base stations at 2-4 sites

As stated previously in this response Imagine's proposed approach is to release the spectrum as two classes of Licence (A-type and B-type), where the type A licence should be awarded to prefer a Fixed NGA operator who prepared to commit to rollout obligations that satisfy the following requirements

- deliver NGA services in parts of the country where there is a recognised infrastructure deficit
- deliver NGA services where customers cannot avail of NGA services from existing providers
- that contribute to the delivery of government policy as reflected in the NBP
- that minimise the requirement for state intervention to deliver NGA grade services to citizens in line with EU SAG requirements
- that can also provide a competitive service in areas where NGA services already exist

The rollout obligations therefore need to ensure:

- a significantly higher rate of rollout than that proposed by Comreg
- a commitment to rollout on a national basis in both urban and non-urban areas
- a regional commitment that aligns to the NBP strategy
- through prioritising rollout to areas where there are little or no existing NGA services to actively contribute to minimising the extent of planned intervention envisaged under the NBP
- a commitment to rollout in areas where NGA already exists in order to increase competition and to address any gaps in existing NGA areas

Therefore Imagine propose the following rollout obligations:

<u>Type A Licence Obligations:</u>

The A-type licence would consist of a minimum 160MHz of spectrum and would have rollout conditions mandating a rapid rollout of a network that can support wholesale access of fixed NGA services across the country. This would encourage competition and support the National Broadband Plan

- Minimum roll-out obligations to rollout NGA compliant FWA Base Stations activated and supplying services on a national basis as follows:
    - o [redacted] within [redacted] year of the spectrum award being finalised.

- o [redacted] within [redacted] years of the spectrum award being finalised.
- o [redacted] NGA compliant Base Stations activated and supplying services within [redacted] years of the spectrum award being finalised.
- o [redacted] NGA compliant Base Stations activated and supplying services within [redacted] years of the spectrum award being finalised.

In addition to the commitment to a total number of base stations deployed commitments could be required to provide an NGA compliant service all 26 counties

Type B Licence Obligations:

For the Type-B Licence we agree with ComReg's initial proposal for the extent of any base station rollout obligation as stated in section 6.58 of the document 15/70

Base station capability metric

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed.

Imagine do not agree with the need for a base station capability metric

In particular this requirement highlights the flaw of imposing condition with significant different consequences depending on the use for fixed or mobile services.

Imagine have reservations regarding the proposed use of base station capacity or spectral efficiency as such a capability metric. For example would the metric be based on the basic capability of the technology e.g. LTE-A has a spectral efficiency defined by 3GPP Standards and would therefore comply or if based on measurements from the actual network deployment would the minimum value apply to all base stations or an average across the licensed region?

Measurement of such a metric would need to take into account the many factors that impact the base station performance such as

- the spread in location and hence MCS levels of customers which is largely outside control of the operator
- variations in capability over time based on customer uptake
- variations in customer activity

and many other factors that might cause the spectral efficiency to vary on an almost real-time basis.

Drivers of Base Station Capability

The network capacity of a radio network largely depends on the spectral efficiency, spectrum bandwidth and site density. A fundamental constraint on the spectral efficiency and hence channel capability is the signal-to-interference and noise ratio (SINR).

However techniques that improve channel capability such as MIMO depend on many factors, such as

- antenna separation
- the level of scattering and multipath propagation in the radio path

- the signal-to-noise ratio of received signals
- the speed of the terminal.

MIMO is at its most effective when there is significant multipath propagation, such as mobile terminals in an urban environment where signals are scattered by buildings and other objects. In an open, rural location, where there is more likely to be good line-of-sight MIMO is less beneficial.

Industry Standards for Spectral Efficiency

In the process of defining the underlying capabilities of LTE technology both ITU and 3GPP set target values for spectral efficiency that need to be met under various deployment conditions. A summary of these are shown in the two tables below:

**Table 8.1 Targets for average spectrum efficiency**

| Radio env. / Ant. Config | | Case 1 [bps/Hz/cell] | Micro | Indoor | Rural/ High speed |
|---|---|---|---|---|---|
| UL | 1x2 | 1.2 | | | |
| | 2x4 | 2.0 | | | |
| DL | 2x2 | 2.4 | | | |
| | 4x2 | 2.6 | | | |
| | 4x4 | 3.7 | | | |

3GPP TR 36.913 version 12.0.0 Release 12 "LTE; Requirements for further advancements for Evolved Universal Terrestrial Radio Access (E-UTRA) (LTE-Advanced)"

**Cell spectral efficiency**

| Test environment (1) | Downlink (bit/s/Hz/cell) | Uplink (bit/s/Hz/cell) |
|---|---|---|
| Indoor | 3 | 2.25 |
| Microcellular | 2.6 | 1.80 |
| Base coverage urban | 2.2 | 1.4 |
| High speed | 1.1 | 0.7 |

ITU-R M.2134: "Requirements related to technical performance for IMT-Advanced radio interface(s)"

What these standards show is that the values vary significantly based on application and environment and that the figure of 4bps/Hz suggested by ComReg based on the Plum analysis in report 15/75 section 3.2.1 is optimistic as a network wide metric. This is discussed further below.

Also when defining an overall spectral efficiency metric in TDD systems the figure should take account of the fact that, unlike FDD systems, in TDD the same 20MHz channel carries uplink traffic also. In ITU-R M.2134 it is suggested that in calculating the spectral efficiency the effective bandwidth is the operating bandwidth normalised appropriately considering the uplink/downlink ratio.

When calculating the capacity of a sector or base station in terms of number of subscribers served for a given service or set of services it is determined which of either the downlink or uplink throughput capability sets the lowest limit. If the ratio of downlink to uplink throughput capability of the base station is greater than the ratio of downlink to uplink demand then the uplink capability is going to determine the sector or base station capacity.

For example in a TD-LTE-A with a TDD ratio of 3:1 and having a downlink and uplink throughput capability of 84Mbps and 12Mbs respectively providing a 30Mbps downlink and 6Mbps uplink service (as indicated as a requirement in the current draft of the NBP specification) then at a contention ratio of 24:1 the base station can serve 67 customers in the downlink but only 48 in the uplink.

This highlights several important issues with the proposed capability metric – firstly that it only considers the downlink whereas in fact the uplink may be the limiting capability factor and secondly the proposed 3:1 ratio may not be the optimum choice to meet either market or NBP requirements. And significantly impact on NGA services.

Proposed Value of Base Station Capability Metric

In defining a base station capability criteria ComReg in section 6.60 and specifically in footnote 164 reference that according to section 3.2.1 of the Plum report 15/75 that 4bps/Hz is achievable with LTE-A using 16QAM. However ComReg have not taken into account the coding rate which for 16QAM varies between 0.369 and 0.602 and is always less than 1. In the same section of the Plum report it states that these are "raw" efficiency values relate to gross bit and do not take account of signal processing overheads or TDD uplink / downlink split. They also do not allow for any MIMO gain.

When coding rate is taken into account as per Figure 3.1 of the Plum report 15/75, which is based on the figures from Table 7.2.3-1 of 3GPP TS 36.213 shown below, to achieve an efficiency of 4bps/Hz a CQI of greater than 12, (representing 64QAM) is necessary thus it is not possible to achieve 4bps/Hz using 16QAM as stated by ComReg in their footnote to section 6.60 (footnote 164).

**Table 7.2.3-1: 4-bit CQI Table**

| CQI index | modulation | code rate x 1024 | efficiency |
|---|---|---|---|
| 0 | out of range | | |
| 1 | QPSK | 78 | 0.1523 |
| 2 | QPSK | 120 | 0.2344 |
| 3 | QPSK | 193 | 0.3770 |
| 4 | QPSK | 308 | 0.6016 |
| 5 | QPSK | 449 | 0.8770 |
| 6 | QPSK | 602 | 1.1758 |
| 7 | 16QAM | 378 | 1.4766 |
| 8 | 16QAM | 490 | 1.9141 |
| 9 | 16QAM | 616 | 2.4063 |
| 10 | 64QAM | 466 | 2.7305 |
| 11 | 64QAM | 567 | 3.3223 |
| 12 | 64QAM | 666 | 3.9023 |
| 13 | 64QAM | 772 | 4.5234 |
| 14 | 64QAM | 873 | 5.1152 |
| 15 | 64QAM | 948 | 5.5547 |

Source: 3GPP TS 36.213 version 12.4.0 Release 12

In the calculations made by Plum in section 3.2.6 of report 15/75 is 4.35bps/Hz achieved by delivering 87Mbps in a single 20MHz channel. However, in the Plum model no account is taken of the increase in interference when adding sectors and/or channels in an n=1 configuration. The effect of this would be that the capacity of each 20MHz channel and hence overall spectral efficiency would be significantly reduced when additional channels are introduced. In our estimate deploying

an n=1 configuration using even 2 x 20MHz channels at the same frequency would at best give a total throughput of c84Mbps for the 2x20MHz configuration therefore giving a resulting spectral efficiency of only c2.1bps/Hz.

To achieve a target spectral efficiency of 4bps/Hz in a real world multiple site network would require that almost all users achieve the very top MCS levels of 64QAM as well as MIMO gain which is not consistent with the simple scenario described in the Plum report 15/75. Imagine's calculations of peak throughput, taking account of coding rates and overheads shows that without MIMO the peak DL throughput achievable with the top MCS level 28 (64QAM) is 56Mbps showing that a throughput of 87Mbps quoted in the Plum report cannot be achieved without MIMO.

In Imagine's case based on the target throughput of 84Mbps per sector this would give a spectral efficiency of 4.2bps/Hz. However to achieve this level of throughput Imagine planned the network as an FWA network with re-use planning appropriate to such a deployment and have included MIMO gain.

However it is also possible that in some cases the distribution of customers within the sector is weighted towards customers at the cell edge. In such cases the resulting site spectral efficiency could be below the proposed 4bps/Hz threshold. It is also possible that in order to meet the threshold an operator may therefore be forced to unnecessarily restrict coverage in order to improve this metric rather than provide service to customers at the cell edge that could negatively impact the spectral efficiency metric. This would have a particularly negative impact for more remote and rural areas that are the target of the NBP.

Imagine Position on Minimum Base Station Capability Metric

We believe that the spectrum efficiency figures proposed by ComReg based on the Plum report do not take sufficient account of practical network deployment considerations. Various sources such as CelPlan document "4G Technologies Myths and Realities" suggest that in practice the average figures for a mobile broadband network are likely to be closer to 1.1bps/Hz to 2.6bps/Hz and furthermore these will vary from rural to urban areas and would also vary depending on deployment scenario - FWA vs. mobile etc.

In reality some sites, for example at the edge of a town, may have sectors facing 'urban' areas while others face rural areas. As noted in Plum report 15/75 section 3.2.2 "Spectrum efficiency is also higher for the wider channel width as the signalling overhead is lower in percentage terms." Therefore the spectrum efficiency for a 5MHz channel will not be as high as a 20MHz channel as implied in section 6.62 of ComReg's document.

For the above reasons the spectral efficiency and hence channel capability for even the same underlying technology will vary depending on:-

- type of use – i.e. fixed, nomadic or mobile
- type of environment i.e. indoor, small cell, urban, rural etc.
- channel width (bandwidth of the channel) due to overheads
- choice of frame structure and TDD ratio

For these reasons it would be very difficult to define or measure a single value for a capability metric that is practical, appropriate and equivalent in all of the above conditions and deployment scenarios.

Imagine believes therefore that having a minimum base station capability metric based on spectral efficiency or base station capability (i.e. throughput) is not appropriate.

If such a metric were to form a part of the rollout obligations then it should be a simple obligation to rollout base stations that have the capability to deliver an NGA compliant service as defined in footnote 71 to paragraph (57) of EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks (2013/C 25/01), which states

*"The final connection to the end-user may be ensured both by wired and wireless technologies. Given the rapid evolution of advanced wireless technologies such as LTE-Advanced and the intensifying market deployment of LTE or Wi-Fi, next generation fixed wireless access (e.g. based on possibly tailored mobile broadband technology) could be a viable alternative to certain wired NGA (FTTCab, for example) if certain conditions are met. Since the wireless medium is 'shared' (the speed per user depends on the number of connected users in the area covered) and is inherently subject to fluctuating environmental conditions, in order to provide reliably the minimum download speeds per subscriber that can be expected of an NGA, next generation fixed wireless networks may need to be deployed at a certain degree of density and/or with advanced configurations (such as directed and/or multiple antennas). Next generation wireless access based on tailored mobile broadband technology must also ensure the required quality of service level to users at a fixed location while serving any other nomadic subscribers in the area of interest."*

In addition to the above general base station capability Imagine believe that the ability to support the provision of wholesale services as laid out in the DCENR Draft Intervention Strategy and associated documents, should be a required obligation.

- a quality of service obligation should apply in relation to each of network availability and voice call standards;

Imagine agree with quality of service obligations as proposed. Specifically in relation to voice call standards proposed and referred to in ComReg 14/101 Imagine agree with the proposed metrics i.e.:

- MOS score: according to GSM standard (GSM Codec =3.8)
- Blocking Rates: Average 2% Worse 4%
- Dropped Calls: Average 2% Worse 4%

- licensees should internalise guard-bands as spectrum should be assigned without guard-bands;

Imagine agree with this proposal

- a default TDD frame-structure based on TD-LTE configuration 2 (3:1) should be applied to incentivise inter-network synchronisation;

Imagine agrees that synchronisation offers a practical measure to mitigate cross border interference and that higher permitted limits could be applied in the case of synchronised networks and as such a default TDD frame structure is necessary.

However imagine would prefer that in the first instance coordination procedures which would facilitate inter-operator coordination agreements should be used to avoid and manage such interference issues as these would permit higher limits to be applied to unsynchronised networks where these did not cause any interference issues.

Imagine agree that in TD-LTE the UL:DL Configuration 2 is the most commonly used configuration and therefore would be preferred as a default. However Imagine believe that this may not be the optimum configuration for networks that may be required in the future to meet the high 6Mbps targets for uplink specified in the NBP and that other UL:DL configurations such as Configuration #3( 2:1 ) may be necessary in order to be compliant to the NBP uplink threshold. It should also be noted that within 3GPP there are ongoing developments and proposals for implementation of dynamic TDD ratio assignments in the future.

Imagine believes that to fully synchronise networks in addition to specifying the UL:DL configuration it is also necessary to agree many other parameters including, for example, the specific Special Sub-Frame configuration in order to achieve synchronisation. This is not referenced in either the ComReg document 15/70 or any of the three Plum reports (15/73, 15/74, 15/75), however a more comprehensive discussion of synchronisation measures is provided in the Ofcom reports - for example in Ofcom document “Public Sector Spectrum Release: Award of the 2.3 and 3.4 GHz spectrum bands, 7th November 2014”, Figure 13: Proposals for key criteria in Inter-operator Synchronisation Procedure.

Imagine would support synchronisation provided such a full set of procedures, as described in the Ofcom document, were laid out and agreed and that sufficient flexibility remains for operators to choose alternative frame structures subject to certain conditions being met if these were required to meet for example uplink requirements of the NBP.

- a permissive BEM should apply to synchronised networks and a restrictive BEM should apply to unsynchronised networks;

Imagine agrees with this proposal

However Imagine note that in the calculations in section 6.108 a figure of 12dBi is used for the antenna gain when in fact recent developments in outdoor CPE have led to the availability of devices with 16dBi antenna gain.

- the terminal station in block power limit set out in the 3.6 GHz EC Decision should be relaxed for fixed outdoor installations;

Imagine agrees with this proposal

- at regional borders a coordination threshold should apply to allow for bilateral/multilateral co-existence agreements; and

Imagine agrees with this proposal.

Imagine also note however that in the calculations in section 6.108 a figure of 12dBi is used for the antenna gain when in fact recent developments in outdoor CPE have led to the introduction of devices with 16dBi antenna gain.

- where agreement in cross-border coordination fails to be met, the coordination threshold limit should be set as a binding licence condition

Imagine agrees with this proposal

### 11.4 Chapter 7

**7.4 Chapter 7 Consultation Question**

7.74 Do you agree with ComReg's preliminary views set out in Chapter 7 and, in particular, with the following proposals:

As a consequence of the approach taken by Comreg and for the reasons set out in this response it follows that the consideration of the resulting proposed structure of the award is necessarily flawed.

Other than acknowledging the fact that a transition will be required in the event that an existing operator of FWALA spectrum does not acquire the same or any spectrum in the proposed award scheme Imagine do not agree with the views set out in Chapter 7.

In the formulation of its approach to dealing with the potential consequences of existing spectrum holders having their licensed frequencies changed or lost altogether ComReg leaps to the unsupported conclusion that

> "…it faced similar transition issues in the context of its MBSA process where existing 900 MHz and 1 800 MHz licensees also faced the prospect of (a) winning more or less spectrum than they then held or no spectrum, (b) winning spectrum rights in a different part of the band and (c) requiring a reasonable time period within which to make the necessary adjustments to their networks to comply with the outcome of that award process."

This continuation by ComReg of implying similarities between the 3.6GHz band and the 900MHz/1800MHz bands is in stark contradiction to the responses received to the Consultation where it can be seen that there is clearly no appetite, interest or substitutability of the 3.6GHz for mobile services and the mobile operators have made that clear in their submissions. Yet ComReg persists in conflating these markets together in implying that there are similarities when in fact there are none. It appears that ComReg is determined, despite all the evidence to that contrary, to associate potential mobile services (at some undefined date in the future) with the obvious and clear need to utilise the 3.6GHz band to provide essential fixed broadband services in parts of the country where there is a clearly accepted infrastructure deficit. This unsupported yet persistent view of ComReg is unreasonably shaping the whole 3.6GHz award and transition process.

Such transition processes as will be required are only those that need concern themselves with situations where transition needs to occur for the migration of either frequencies or customers where an existing Fixed Service is being replaced by a new Fixed Service. There is no mobile component of any transition in the 3.6GHz spectrum. This will only occur where NGA networks are deployed and given the existing remote locations of existing FWA operators will be dependent on NGA Fixed Wireless deployments

There are a number of significant factors that make the potential transition scenarios vastly different from the MBSA process. Notably:

- In the MBSA process the transitions were between similar if not identical technology and services.

- In the GSM/3G networks to which MBSA process related there would have existed already for most customers coverage if not from the same operator in multiple bands then from an alternative operator and the likelihood of a customer facing total loss of service was very remote.
- The majority of transitions were frequency changes within the same band
- The equipment deployed at both base stations and customer devices was based on a single common set of GSM and 3G technology standards and would have been similar, if not identical among the operators affected.

In the case of the existing operators of licences in the 3.6GHz band there is a wide variety of equipment types, FDD and TDD technology and multiple different standards based (e.g. 802.16) and proprietary systems. Even where existing operators acquire new licences there will be transition scenarios where these operators will need to deploy completely new equipment or where new licences require frequency changes that are not supported by existing equipment.

There are a number of flawed aspects to ComReg's overall approach to Transition. These stem from related but separate factors affecting the award process.

There is an assumption that the winner of spectrum in the award process has a desire and intent to roll-out services in its licensed area as soon as possible (similar motivation to that which existed in the mobile market space). There is real potential for existing fixed line infrastructure operators such as Eircom to acquire spectrum with no intention of rolling out services (except in meeting its coverage obligations in the most minimalist of ways) while protecting its legacy network assets. This is a sensible commercial strategy yet not one envisaged by ComReg it its analysis. In this scenario, existing FWA operators (who now have no independent future) are to be depended upon to continue to provide services. This is in an area almost certainly suffering from a severe infrastructure deficit already.

Secondly, ComReg passively assume that there is interest from existing operators in continuing to provide services into the future in areas where they fail to secure spectrum rights. There is no evidence that such willingness exists. It may be reasonable to assume that there may be such willingness if the provision of the service was in itself a profitable activity but it must be recognised that this is not necessarily the case. Indeed it can clearly be stated that continuing to provide the wireless services that we do to our customers throughout the country is a strategic investment on our behalf into the Regional and Rural market. We intend that, having secured the spectrum rights in the award process, we will deploy a commercially successful LTE-Advanced network that will have the needed scale to operate efficiently and profitably. It is for this sole purpose that we continue to operate the current old generations of technology that support the vast majority of the 27,000 existing wireless customers that are referred to in 6.34[44] and as identified earlier in ComReg's assessment this number could be significantly under estimated increasing the number of customers that may be affected by the loss of service.

[44] Consultation on Proposed 3.6 GHz Band Spectrum Award – ComReg 15/70

ComReg cannot assume that should we be unsuccessful in the award process that there is any willingness on our part to continue to provide services for an indeterminate period to existing customers while a successful bidder in the award process was contemplating rolling out services or. It is quite likely that in the event of us not being successful in the award process we would move immediately to cease providing customers with service albeit in line with our contractual and other obligations. There would be no commercial reason for us continuing to sustain the LTE Project losses we are currently carrying if we were unsuccessful in the award process.

However, ComReg proposes to go further in the award process by obligating existing operators to comply with unspecified obligations and costs up to and including liquidated damages.

> *"7.53 …Each Existing Licensee would be obliged to accept the prospect of paying liquidated damages to ComReg in respect of non-compliance by it with the transition plan. In ComReg's view, the paying of liquidated damages and the prospect of such payments are appropriate (i) to reflect any potential losses to ComReg and (ii) to incentivise the completion of Transition Activities in an effective and timely manner, and ComReg would propose to adopt liquidated damages proposals similar to those used in the MBSA process."*

Such a prospect in itself may be sufficient to deter existing licensees – many of whom are comparatively small operators – from entry into the process at all. ComReg must bear in mind that despite its obvious preference to treat the 3.6GHz band in a similar fashion to that which it utilised in the 900MHz/1800MHz process it is not dealing in this process with operators of such scale and financial resources.

In 7.57 ComReg persists in characterising the issues of continuing to supply customers with their existing services post an award process as being *"…of a short-term transitory nature.."* yet it provides no evidence whatsoever to support this view. As has already been pointed out there is every reason to believe that not only will these delays not be short-term but they may be quite lengthy since services could be terminated rapidly following an unsuccessful award process and a new entrant could not begin to provide new services potentially for a year or longer – even if they were motivated to do so. ComReg must continue to be mindful that the strongly growing mobile market in the early years of this century is not a good proxy for the situation in the fixed wireless market. Indeed, if these were similar markets the current infrastructure deficit in regional and rural Ireland would not exist!

It is clear that the intent by ComReg is to impose sufficient obligations on existing licensees that it can ensure that existing customers will continue to receive service until such time (if ever) as a new licensee gets around to deploying new infrastructure. It is clear that it will be a requirement on existing licensees to sign up to comply with these as yet unspecified obligations to permit entry into an award process even to extent of exposing themselves to liquidated damages of an unspecified nature. Not only does this distort the playing field between existing licensees and potential new entrants it potentially does so at considerable expense to existing licensees for which they can obtain no benefit and for which they do not have the financial resources to sustain. This is unfair.

**Imagine proposal:**

On the basis of an award of the A licence as proposed with a commitment to wholesale access transition arrangements become much easier and removes much of the uncertainty and complex arrangements across all licence areas. This is particularly so as the A licence has conditions that will ensure an extensive and rapid rollout.

Where the Type A National Licence is Awarded Imagine propose the following simple transition arrangements:

Within the A Licence

Where an existing FWA operator within the A Licence range:

- Has acquired a new B licence – they must move operations to the new B licence within 3 months
- Has not acquired new spectrum
    - Then if FWA NGA services are available within the area from the new A Licence holder then the existing FWA operator must cease within 3 months, or
    - If FWA NGA services are not available within the area from the new A Licence holder then FWA operator can continue to provide service until such time as the spectrum is required by the new A Licence holder to provide NGA services.

Within the B Licence

Where an existing FWA operator within the B Licence range:

- Has acquired a new A or B licence – they must move operations to the new A or B licence within 3 months
- Has not acquired any new spectrum, then
    - If FWA NGA services are available by new B Licence holder within area then the existing FWA operator must cease within 3 months.
    - If FWA NGA services are not yet available from the new B Licence holder within the area but are planned to be rolled out in the future, the existing licence holder (within the B range) can continue until such time as the spectrum is required by new B Licence holder to provide NGA services
    - If a new B licence is awarded for use other than the provision of FWA NGA services then the existing licence holder (within the B range ) must cease operations within 3 months of being required to do so by the new B licence holder even though there may be no alternative NGA service available.

For Both the Type A and B Licences:

All FDD based systems should be transitioned to TDD systems or shut down within 3 months of the licence award.

## The nature of the award process influences transition requirements

It should be a clear objective of the award process to minimise transition requirements. This will directly translate through to minimal impact on existing customers and services.

Imagine believe that the allocation to Imagine of a 160MHz Type A national licence if based on the following frequency plan will in fact minimise the effect of transitions required.

[redacted]

In this analysis it is assumed that each of the existing operators acquired new spectrum allocations for these licences. Should this not be the case then the transition arrangements are even further reduced.

[redacted]

It should be noted that this analysis is based on available information taken from the Comreg website in March 2015 and may not be fully accurate.

**Imagine Proposed Spectrum Allocation**

**Transition Analysis of Existing Licences**

[redacted][45]

[45] Source: Imagine analysis based on available data from ComReg website, March 2015

- Transition Proposal 1: the formulation of a transition plan for the 3.6 GHz band;

As identified earlier by Imagine, in ComReg's assessment it has for some reason significantly reduced the number of customers that may be affected by the loss of service Imagine do not agree with the proposal.

- Transition Proposal 2: the Transition Protected Licence; and

As identified earlier by Imagine, in ComReg's assessment it has for some reason significantly reduced the number of customers that may be affected by the loss of service

Imagine do not agree with the proposal.

- Transition Proposal 3: the Transition Unprotected Licence.

As identified earlier by Imagine, in ComReg's assessment it has for some reason significantly reduced the number of customers that may be affected by the loss of service

Imagine do not agree with the proposal.

# 12 Annex A: About Imagine

Imagine is an Irish full service telecommunications company providing voice and broadband services nationally to both residential and business customers. These services are provided utilising the incumbent Eircom's fixed infrastructure and Imagine's own fixed wireless infrastructure. This includes the 4G WiMAX service in the 3400-3600 MHz spectrum range. The WiMAX service has proven that high demand for fast broadband exists in the regional and rural areas and that 4G wireless technologies satisfy this demand.

Imagine was a participating member of the Next Generation Broadband Task Force. As an Irish company with considerable expertise and experience in both the Fixed and Mobile industries across Europe and the Irish communications market structure and development, Imagine informed the task force on the then existing capabilities and future development of wireless technology and the importance of wireless infrastructure in Ireland meeting the EU objectives as set out in the DAE. Of critical importance was the developing Global standards for 4G LTE wireless technology and the distinction between LTE deployed to provide fixed NGA services as opposed to using LTE for mobile services. These inputs were adopted into the NGB Task Force report and the Government's National Broadband Plan (NBP) in which it is considered that "4G Fixed Wireless" would be an important infrastructure to use in order to meet the European and NBP objectives.

Since publication of the NBP and as recognised by the EU, there has been a step change in the development of next generation wireless technology. Driven by the rapid evolution of "Smartphone" and "tablet" capability and the global demand for high speed data centric IP infrastructure to meet "explosive" consumer demand, the development and deployment of LTE infrastructure has been unprecedented. Reflecting demand, take up of 4G services is at a rate of 10 times faster than 3G. This market demand driven environment has significantly accelerated the requirement for ever increasing network capacity and increased speed and a global ecosystem of infrastructure and device development. Initial LTE standards and roadmaps for future development have been rapidly surpassed by the new "LTE Advanced" standard.

Of particular importance has been the development and take up of the Time Division Duplex protocol variant of LTE (TD LTE) designed to maximise the use of spectrum in the most efficient way to deliver higher bandwidth services. Derived from fixed wireless protocols and standards, TD LTE uses the same channel for downloading and uploading data where the spectrum resources are allocated proportionally to reflect and cater for normal broadband usage where the primary requirement is downloading data. TD LTE significantly increases the capacity to deliver high speed broadband services and is driving the convergence of fixed and wireless networks delivering service capabilities in terms of speeds of 150Mb, similar to fibre, superior to alternatives such as FTTC and fully capable of meeting and exceeding NGA requirements. New advanced standards, and vendor roadmaps over the next 5 years, envisage the further convergence of fibre and wireless with speeds of 700Mbs being demonstrated by vendors today.

Requiring ever increasing larger bandwidth and the capability to use LTE for fixed services, the frequency bands 3.4-3.6 GHz and 3.6-3.8GHz were adopted as LTE bands 42 and 43. Recognising the importance of TD LTE infrastructure in delivering NGA services, Europe has designated these frequencies as preferred TD LTE.

Imagine has concluded trials and selected a vendor partner to deploy a new super-fast broadband infrastructure using advanced 4G Time-Division Long-Term Evolution (TD-LTE Advanced) which uses LTE spectrum in a more efficient way to deliver higher capacity broadband services to users. This infrastructure will be deployed using Imagine's current (3400-3800) spectrum in the 3GPP defined LTE bands 42 and 43. Imagine's spectrum position combined with the advanced capability of TD LTE Advanced deployed for fixed wireless using high channel bandwidths (initially 2x20MHz) will enable the company to deliver high-speed NGA services of a minimum of 30Mbps and up to 150Mbps to a large population over a wide area of 13km in diameter.

Continuing the evolution of high speed 4G wireless networks, as a global standards based infrastructure, TD-LTE Advanced will derive the benefit of ongoing development to meet the industry anticipated increasing demand for high speed broadband services, capacity and speed.

As recognised by the EU and set out in the SAG[46], the rapid development and deployment of LTE Advanced infrastructure in the last few years has provided a step change in the technologies available to deliver NGA services to European citizens. The imagine TD-LTE Advanced network not only meets the guidelines set out in SAG, it significantly exceeds the minimum required performance in terms of capacity, speed and user experience envisaged in the DAE. With the quantum of spectrum available to be utilised in the Imagine network we can fully exploit the potential of a TD-LTE Advanced network to deliver the very best high speed services possible with the most efficient frequency plans. Performance enhancements such as 4x4 MIMO and future LTE Advanced releases are planned. While a 2x20MHz channel utilisation today delivers a throughput of 300Mbps, Softbank have demonstrated 700Mbps throughput using a 4x20MHz configuration[47] and this capability will be available to Imagine should we retain sufficient spectrum.

Imagine's unique spectrum position, harnessed to provide ultrafast NGA fixed broadband services, provides Ireland with a significant advantage over other European markets in addressing the digital divide, and meeting the objectives set out in the NBP of delivering high-speed broadband to all citizens by 2020. Imagine intends to provide wholesale access to the network to other operators and service providers on an open basis ensuring consumers benefit from competitive and innovative services. This will be a useful mechanism to extend TD-LTE Network capability to smaller regional operators who currently operate localised fixed wireless networks but may be unable, due to the significant investment requirement, to deploy LTE Advanced networks themselves. This ensures the continuity of the valuable service that these companies provide to communities that are underserved for even basic broadband.

[46] http://ec.europa.eu/competition/state_aid/legislation/broadband_guidelines_en.pdf

[47] http://www.fiercewireless.com/tech/story/softbank-huawei-lte-test-reaches-770-mbps-35-ghz-band/2013-09-15.

Imagine believes that its TD-LTE Advanced network will be an essential component in the integrated and effective solutions required to meet the expected targets set out in the National Broadband Plan (NBP) and that the NBP's targets can only be delivered on time and most cost effectively to all consumers if a combination of new FTTH, FTTC and Fixed Wireless infrastructure is deployed.

With a single base station costing approximately €135K capable of providing NGA services to customers within an area of 13km diameter (and up to 22km), TD-LTE Advanced fixed wireless is the quickest, most economic and cost effective method of connecting customers to fibre. With the planned deployments of FTTx and FTTC of other infrastructure providers already set out we anticipate that significant areas of the country can only be serviced by TD-LTE Advanced Fixed Wireless while customers in other areas will gain important benefits from increased consumer choice and competition.

In addition, the economic case for FTTX infrastructure is not only limited to densely populated areas but within those areas to the effective distance from the fibre node, which in the case of FTTC is from the cabinet. The technical restrictions of FTTC means that it does not uniformly deliver NGA level speeds and bandwidth to all household/business in an 'area', While operators may talk about a service being available in a general area, being available *in* an area does not necessarily mean that the service is available to *everyone in* that area. Therefore not only will TD-LTE Advanced Fixed wireless be required to deliver NGA in areas where FTTX infrastructure will not be deployed at all, there will be a significant requirement for TD LTE Fixed wireless to extend NGA coverage in 'areas' where actual availability of FTTC is limited - though claimed - by fixed network providers.

Imagine will be providing open wholesale access to other service providers and to other infrastructure operators to improve or extend their current and planned network deployment footprint and improve the service portfolio to their customers. In this regard we are in discussions with the main operators and service providers in the market with a view to concluding wholesale agreements**.**

The Imagine service will be offered as a competitive and complimentary alternative to the established high speed 'NGA' service offered on, for example, Eircom's FTTC network. It is dimensioned and specified to deliver a comparable or better service and user experience and will be provided to customers on the same or equivalent terms and conditions as other NGA services. The imagine network is fully flexible to meet consumer demand and dimensioned to meet expected growth in data consumption and demand. Already planned TD-LTE Advanced releases and roadmap developments will further enhance overall speed and capacity. Additional capacity to meet demand in an area will be provided by overlapping multi-base station deployments and additional overlay sectors where required.

Imagine's intent is to provide new infrastructure to deliver NGA services across Ireland leveraging the potential of the developing 4G TD-LTE Advanced Technologies. This is predicated upon Imagine have long term security of access to appropriate spectrum required to deliver this FWA network. We are engaged and working with DECNR to ensure that the full benefit of the Imagine TD-LTE Advanced infrastructure can contribute to delivering the objectives set out in the Government's NBP.

# 9 Joint FWA 4 Operators

Joint response received from four FWALA Operators listed below:

- Lightnet
- permaNET
- Ripplecom
- WestNet

Lightnet, permaNET, Ripplecom & WestNet

# Joint Response to the Consultation Paper entitled Consultation on Proposed 3.6 GHz Band Spectrum Award. ComReg 15/70

We would initially point out that in terms of submitting responses to this detailed consultation that unlike the large MNO companies, small FWA companies are disadvantaged by not having had experience of previous auction processes nor access to technical expertise in assessing the relative merits, advantages and disadvantages of the alternative auction processes outlined. ComReg should bear this in mind when weighing up the responses received and deciding on the options available to it in the final design of the allocation process and in designing the rules that should apply.

**Section 3: Draft Regulatory Impact Assessment (RIA)**

" ComReg is of the preliminary view that the 3.6 GHz band should be assigned by way of auction with no other bands included in the auction".

There are a number of reasons why we propose that a *portion* of the spectrum in rural areas should be designated as primarily for FWA where operators have expressed an interest in rollout of NGA equipment.

1. The relatively large amount of available spectrum.

2. The national interest to deliver NGA broadband to as many rural premises as possible in the shortest timeframe and the lowest impact to the taxpayer.

3. The history of service provision by FWA providers. We contend that had it not been for ComReg decision 10/29 or had ComReg provided a much earlier consultation on the 3.6Ghz spectrum then there would have been significantly greater investment in licensed FWA with significantly more competition and subscribers connected in rural areas. As it is, more that 60% of the known 74,000 FWA subscribers in Ireland are connected using license exempt equipment, largely for this reason. By ensuring adequate spectrum is made available (at a reasonable price) in large areas ComReg can encourage investment in the sector which may significantly reduce the dependence on state subsidy in the NBP.

4. Typically the amount of spectrum required to deliver competitive mobile services is significantly less that the spectrum required to deliver competitive fixed services as the expectation of the consumer is that the mobile service will involve a (relatively low) usage cap typically less than 20GB, whereas the expectation for fixed service is that there is no cap - or a relatively high one (200GB). In addition there is a stated intension to release other spectrum bands in the near future (2.3 and 2.6GHz) that are better suited to Mobile services and therefore likely to be economically out of reach for FWA providers.

It is in our opinion inappropriate to award a significant amount of spectrum via an auction process to MNOs for use solely as capacity spectrum in hotspots in the larger towns within the rural regions. Due consideration must be given to the national interest in delivering NGA access to as many rural locations as possible with the least impact to the taxpayer. Requirements for in-building capacity spectrum by MNOs could and should be met through an obligatory system of sub leasing of spectrum for these purposes. We extend this point to highlight that it should not be permitted to acquire spectrum on the basis of the *potential* for future use and that any award should be based on presentation of clear

evidence of concrete rollout plans. In meeting its statutory obligations Comreg must ensure that these plans are real and substantiated.

**Section 4: Key aspects of the Proposed Award Spectrum.**

The band plan will be TDD, 1x 25MHz slot and 65x 5MHz slots.

Regions will be established in line with the principles established by ComReg. (Option. 2)

A license duration of 15 years should apply to the 3.6GHz band.

**Section 5: Award Type and Format**

A cap of 150-250Mhz per operator should apply

The minimum price should be apportioned on a 50/50 basis (SAF and SUF).

Minimum price range of between €0.015 and €0.025 per MHZ per capita.

For the reasons already outlined above and in our response to 14/101 we are supportive of the following ComReg proposals

1. That the 3.6Ghz band is assigned with no other bands included in the process.

2. That the region model (option 2) proposed by ComReg is appropriate.

One potential issue that has been identified with the option 2 region model proposed is where a transmitter is located in one region whose target coverage area is in another region, e.g. a transmitter in a urban region which has extensive rural coverage. A potential solution is in obligatory sub-leasing of spectrum discussed under section 6 response below.

3. That a long license duration (we suggest a minimum of 20 years) is appropriate.

4. That a cap should apply. We recommend a cap of 100Mhz in an initial phase (perhaps 2 years) with opportunities to acquire additional spectrum provided defined criteria (to be developed) are met. We propose that these should include at least the number of subscribers connected in a given license region.

5. That rollout obligations should apply to successful bidders and failure to comply within specified timeframes should result in loss of access rights to spectrum.

Minimum Pricing.

The economies involved in fixed wireless networks are significantly different from those of MNOs as is clearly understood by ComReg. Comreg appear to acknowledge this in the proposed pricing model where a minimum price of €0.015 is proposed for rural regions vs. €0.025 for urban. However this does not go far enough. Given the national interest, it would seem appropriate that a much reduced SAF (up-

front payment) should apply to operators who indicate an intension to deliver NGA services in rural areas. ComReg can easily ensure the legitimacy of such operators by specifying rollout obligations.

Setting the minimum price of a region based on an assumption of full coverage of the population within that region is false. The population covered is more accurately determined by an analysis of coverage from known mast sites.

ComReg report that there are 120-170 BS currently in the rural regions, each with an FWALA service area of 314km$^2$. This gives a total coverage area of approx 45,000 km$^2$. However many of these BS are in close proximity to each other so the real coverage is likely less than 30,000km$^2$, less than 40% of the area of the country. Although it may be possible to develop new high sites these are likely to be of lesser economic value in connecting additional subscribers. In addition, although the population density is likely greater in the existing FWALA coverage areas, due to the LoS nature of 3.6Ghz it is also clear that fixed wireless can connect to significantly less than 100% of premises in these coverage areas.

In deriving the minimum price, the population numbers that may be potential customers for FWA in rural areas should exclude the population of larger towns where there is access to fibre or cable technologies or where access to fibre is planned to be available in the near term. Indeed given the recent announcement by Eircom and the proposals of the NBP the subscriber base that may be connected by NGA FWA is likely to reduce significantly between now and 2020. All of this would greatly reduce the population number used to determine the minimum price point.

Finally, we contend that rather than a 50/50 split of the SAF vs. SUF that a 25/75 split would encourage more participation by existing smaller companies and new entrants.

Spectrum Limit.

To ensure adequate competition and to curtail spectrum hoarding, a spectrum limit of 100MHz per operator per region for an initial period should be adopted. Rollout conditions may be specified such that if operators fail to meet required targets (as reported to ComReg) that they may lose their entitlement to some of all of the awarded spectrum.

License Duration.

There should be a provision to extend the license duration to 20 years. We agree with DotEcon's comment that "spectrum use typically requires long-term, large-scale investments". To provide for business continuity and ongoing network investments there has to be an option for the regulator to extend licenses beyond the proposed 15 or 20 years. Irrespective of the initial license duration if a license were to terminate with the next 5-7 years there would be no incentive to continue to invest in the network. This has been apparent from the lack of investment in FWALA. The regulator should furthermore provide a commitment to conduct a consultation and issue a decision on existing 3.6GHz licenses at least 5 years before the termination date of such licenses so that operators can make appropriate business decisions and preparations for any potential changes.

**Section 6: License Conditions**

Subject to interference conditions being met, there should be an obligation on license holders to provide spectrum to other (possibly smaller) operators in areas where they do not plan to provide coverage within specified time limits. As stated earlier, there should also be an obligation on FWA license holders in large rural areas to sub-license spectrum for in-building capacity spectrum in urban hot spots. The pricing model for such sub-leasing should be determined in advance of the spectrum award process but we propose that the pricing should be based on a similar population model as ComReg propose and should discourage opportunism.

The obligation to sub-lease spectrum should also apply in situations where a transmitter in one region may be used by another operator to serve a population in an adjacent region. Provided that the requesting operator can demonstrate to ComReg's satisfaction that their frequency plan does not impact on the requested operator then there should be an obligation to sub-lease the requested spectrum.

**Section 7: Transitional Issues**

It is presumed that under a transition license (protected or unprotected) that an operator will be authorized to continue to provide services using the current FWALA band plan, equipment and conditions of use.

In the case of the transition unprotected license it is assumed that the operator would be protected from interference by unlicensed transmission and that the operator could continue to avail of ComReg's compliance resources to investigate and resolve any such issues.

In setting out its proposals for Transition Plans and timelines ComReg has made reference to the MBSA process. However we would point out that transition issues for Fixed wireless services are significantly different to mobile services. In the case of mobile services it may be presumed that the CPE devices (handsets) will incrementally be changed by the subscriber base over time to avail of the new services or bandwidth provided by the operator. In the case of FWA truck rolls may be required to each subscriber premises. In a situation where an operator is planning to upgrade equipment in a certain sector and where there may be several hundred subscribers in that sector then in order to provide continuity of service the operator would have to

1. Upgrade the BS with the new equipment, transmitting in alternative "turning space" spectrum.

2. Implement a plan to replace equipment at each CPE premises, requiring truck rolls to each location

3. Once all CPE equipment had been replaced then turn off the "old" BS transmitter for that sector and retune the "new" BS equipment to the final frequency assignment.

4. The operator would have to continue steps 1-3 for all other sector transmitters at the BS.

Given all of this it is likely that the timeframes involved would not be equivalent to those in the MBSA process.

Under the terms of the Transition Unprotected License we suggest that the specific frequency assignment is a matter that should be arbitrated by ComReg on a case by case basis prior to the license issue. There are significant differences in the frequency agility of 3.6GHz equipment. An existing licensee may have deployed equipment with customers which may have a fixed range of operation within a 30 or 40MHz section of band, whereas much of the NGA equipment that would likely be deployed under a new license is capable of operating in any contiguous block of the proposed frequency plan, in 5, 10, 20, 40MHz or higher bandwidths.

Given the national interest in providing high speed wireless services to the maximum number of rural consumers, and in terms of maximising competition in the market, it seems contradictory that on the one hand DCENR is proposing to provide state aid to provide fibre services to each premises, whereas ComReg is proposing to increase FWALA fees. As a result we would advocate that there should be no fee increase for transition unprotected FWALA licenses.

Regarding the duration of a Transition Unprotected license our view is that this should not necessarily have a maximum term. ComReg should allow flexibility in this regard and determine when and if a license should be terminated based on market conditions. We suggest that a licensee operating under a transition unprotected license should be given a minimum of 18 months notice of the termination of the license in order to minimise consumer disruption and to allow for transition arrangements for those consumers to alternative provider(s).

# 10 Joint FWA 16 Operators

Joint response received from 16 Operators listed below:

- Airwave Internet Ltd t/a Airwave Internet
- Ajisko Ltd (t/a as) Integrated Media Solutions
- Atlantek Computers Ltd
- Carnsore Broadband Ltd
- DigitalForge
- Interpoint Technologies Ltd
- Ker Broadband Limited t/a KerNet Broadband
- Kerry Broadband Ltd
- Link Broadband Ltd
- Lighthouse Networks Ltd t/a Lightnet
- Mr Paul Humphreys Meanus, t/a Maints Broadband
- Ninetreehill Broadband Ltd
- Rapid Broadband Ltd
- Real Broadband Ltd
- Skytel Networks Ireland Ltd t/a Skytel
- Wireless Connect Ltd

# Response to Consultation 15/70

# on

# Commission for Communications Regulation's

# 10 July 2015 Proposed

# 3.6Ghz Band Spectrum Award

28 August 2015

Mr Joseph Coughlan
Commission for Communication's Regulation
Irish Life Centre
Abbey Street
Freepost
Dublin 1
Ireland

**E-mail:marketframeworkconsult@comreg.ie**

Dear Sirs,

**Submissions to Comreg 15/70**

You have requested the all input and comments reference the relevant section/paragraph number in your consultation document. Accordingly please find a submission one behalf of those subscribers listed on the schedule to this letter.

The main themes would appear to apply to many if not all 80 or so FWA operators within the State but the matters raised herein are without prejudice to any and all separate individual submissions as may be made by the subscribers hereto. Please therefore treat this submission as a separate general submission made by each and every subscriber as named in the schedule. Please also note that nothing stated in this submission is to be interpreted as comprising acceptance of or agreement with the contents of the DCENR's 15 July 2015 NBP Consultation Reports, upon which separate submissions will be made in due course.

There has been insufficient time commensurate with the resources available to the majority of the market operators in the FWA sector to be able to read digest analyse

consider and make meaningful replies to all of your consultation in the time ComReg has permitted, especially as this time has been set to run over the holiday period and has run in parallel with the voluminous NBP consultation reports. A number of FWA operators have today made a submission to DCENR about why they have been and are unable to summit plans so as to exclude their coverage areas from the areas to be subvented under the NBP. That letter contains a number of points relevant to this consultation, not least in relation to the unfairness of ComReg's process in its one-size-fits-all approach to all stakeholders' resources and ability to make submissions in the time granted and for that reason a copy will be forwarded to be read alongside this submission. This submission is therefore far from complete and we invite ComReg to permit us to make further supplemental submissions in order that this submission can be fully completed.

In an attempt to summarise the core message of this submission, we take the view that ComReg cannot divorce itself and run its processes isolated from the NBP. It appears to us that the European Commission's State Aid Guidelines confer a critical role upon ComReg, bit in relation to the design of the NBP but also in relation to the adoption of policies designed to reduce as far possible the need for State aid.

In both senses the 3.6 Ghz spectrum appears to be fundamental, not only in the short-term to continue service to FWALA customers in rural areas as the transition to FTTH takes place, but also so as to enable the unlicensed FWA sector to upgrade their networks to NGA services (thereby enabling their coverage areas to be subvented) and to permit existing FWALA license holders to continue in their investments to do the same. In short, what is at stake here and what is in ComReg's hands, is the ability of the sector to continue to provide services to customer and to compete with other means of broadband service delivery.

ComReg's role therefore appears to be vital in addressing these concerns. The price, cost and ROI in respect of acquiring a 3.6 Ghz licence will inevitably be affected by the rollout of fibre under the NBP programme and ComReg must take this into account in deciding how to deal with the spectrum. On one analysis the license value could be considered almost worthless because even though fibre could roll out either very quickly or very slowly, it is impossible to predict at this stage where those areas will be and therefore where there might be value in the 3.6Ghz licenses. It is for these reasons that we believe that an auction process designed to maximize the price for these licenses will be damaging both to stakeholders, competition in the market and therefore for consumers.

## General

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2 Disclaimer – this is given on behalf of the Commission for Communications Regulation, defined as "the Commission", but that expression is not used hereafter in this document. Instead the expression "ComReg" is used and, confusingly, the expression "Commission" is used when referring to the European Commission (e.g. 3.143) and the Commission of the Community (e.g. A.2.9).

**Question: Is this Disclaimer not intended to apply to the body described as "ComReg" and should not either "the Commission" as defined be further defined to include the expression "ComReg" or in the alternative for the disclaimer to be extended to include the expression "ComReg"?**

**It is submitted that it is so intended.**

## ComReg's legal obligations

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8 1.2 This states ComReg has had regard to its most relevant obligations, objectives and duties as summarised in Annex 2.

208 Annex 2

This summary does not include any reference to European Commission's EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks (2013/C 25/01) ("SAG") and in particular to paragraphs 42 and 44 thereof.[1]

[1] These state the following:
"(42) **The role of NRAs in designing a pro-competitive State aid measure in support of broadband is particularly important.** The NRAs have gained technical knowledge and expertise due to the crucial role assigned to them by sectoral regulation (54). They are best placed to support public authorities with regard to the State aid schemes and should be consulted when target areas are being identified. NRAs should also be consulted with regard to determining the wholesale access prices and conditions and solving disputes between access seekers and the subsidised infrastructure operator. Member States are encouraged to provide NRAs with the resources they need to give such support. Where necessary, Member States should provide an appropriate legal basis for such involvement of NRAs in State aid broadband projects. In keeping with best practice, NRAs should issue guidelines for local authorities which include recommendations on market analysis, wholesale access products and pricing principles

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**Question: Does ComReg accept that it has a particularly important obligation in designing a pro-competitive State aid measure in support of broadband?**

**It is submitted that ComReg does have this obligation.**

**Question: Does ComReg accept that the NBP is a proposed State Aid measure?**

**It is submitted that this is unarguable.**

**Question: Does ComReg accept that it has a particularly important obligation in the design of the NBP?**

**It is submitted that this is unarguable.**

**Question: Does ComReg accept that the State is obliged by the SAG to take account of spectrum (re-)allocations leading to possible network roll-out in the target areas that could achieve the objectives of the granting authorities without the provision of direct grants?**

**It is submitted that this is unarguable.**

**Question: Does ComReg accept that as the State's national regulatory authority the burden of the obligation described immediately above is placed upon ComReg?**

**It is submitted that this is unarguable.**

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taking into account the Electronic Communications Regulatory Framework and relative Recommendations issued by the Commission (55)." [Emphasis added]

"(44) So that the measure is properly designed, the balancing test further requires that State aid is an *appropriate* policy instrument to address the problem. In this respect, whilst *ex ante* regulation has in many cases facilitated broadband deployment in urban and more densely populated areas, it may not be a sufficient instrument to enable the supply of broadband service, especially in underserved areas where the inherent profitability of investment is low (58). Likewise, although they can contribute positively to broadband penetration (59), demand-side measures in favour of broadband (such as vouchers for end-users) cannot always solve the lack of broadband provision (60). Hence, in some situations there may be no alternative to granting public funding to overcome the lack of broadband connectivity. **Granting authorities shall also take into account spectrum (re-)allocations leading to possible network roll-out in the target areas that could achieve the objectives of the granting authorities without the provision of direct grants**." [Emphasis added]

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210 A2.8 ComReg accepts that it must ensure competition is not distorted by any transfer or accumulation of spectrum rights.

**Question: Does ComReg accept, if an accumulation or distortion of FWALA spectrum rights has taken place with a distorting effect, ComReg is under an obligation to take steps to remedy the effects of that distortion?**

**It is submitted that ComReg is under such an obligation.**

211 A2.11 ComReg's obligation to encourage access to the internet at reasonable cost to users is noted.

**Question: Does ComReg accept that this point requires ComReg's to implement measures aimed at achieving this purpose, particularly in low density rural high cost areas such as are served by the FWALA licenses and any replacement thereof?**

**It is submitted that ComReg is under such an obligation.**

A2.12 ComReg's obligation to promote the ability of ECS end-users to access and distribute information or use applications and services of their choice is noted.

**Question: Does ComReg accept that that these end-user abilities are or can be directly affected by whether or not such end-users have access only to basic or to next generation access ("NGA") speeds?**

**It is submitted that this is unarguable.**

**Question: Does ComReg accept it is obliged to promote the ability of end-users of basic broadband services to have access to NGA services?**

**It is submitted that this is unarguable.**

A2.13 ComReg's obligation to promote regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods is noted as is ComReg's obligation to safeguard competition to the benefit of consumers.

**Question: If ComReg has previously makes spectrum available to meet particular needs and or objectives as it has done in the case of 3.5Ghz for FWALA licenses, does ComReg accept that it is under and**

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**obligation to ensure a consistent regulatory approach in order to promote regulatory predictability?**

**It is submitted that ComReg is under such an obligation.**

**Question: Does ComReg accept that its obligation to safeguard competition for the benefit of customers includes, where necessary, the protection and or promotion of a section of the market which could be eliminated from the market by ComReg's administration/ management of spectrum or, if appropriate, previous lack thereof.**

**It is submitted that ComReg is under such an obligation.**

213 A2.15 ComReg's obligation to take utmost account of not creating technology discrimination is noted.

**Question: Does ComReg accept that this obligation extends not only to the effects of the exercise of ComReg's functions but also to the effects of ComReg's lack of exercise of such functions?**

**It is submitted that this obligation does so extend.**

**Question: On the basis that ComReg has a particularly important obligation in the design of the NBP, does ComReg accept that it is under an obligation to apply the SAG for the purposes of defining NGA compatible technology?**

**It is submitted that ComReg is under such an obligation. Lest ComReg decline to answer querying relevance, this is relevant because the importance and cost of licensed spectrum to replace the current FWALA licenses is affected by DCENR's current definition of compatible NGA technology (only licensed spectrum using IMT LTE Advanced technology). Such a definition would appear to be within ComReg's remit, not that of DCENR. If ComReg determined, as the European Commission appears to have done in accordance with the principles of technological neutrality (the reverse of discrimination) that unlicensed spectrum is capable of NGA compatibility then the pressure on FWA market operators to upgrade their networks to avoid being included in the NBP Intervention Areas ("IA"s) and face market annihilation will be much reduced in the immediate term. Of course, such a course would also reduce immediate competition for**

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**the proposed new 3.6Ghz licenses, thereby creating a potential conflict of interest for ComReg.**

**Question: Has ComReg defined technologies which are or are not NGA compatibility in compliance with the SAG for the purposes of the NBP?**

**Question: If technology discrimination is occurring as a result of another State organ's intervention in circumstances where ComReg has not exercised its function in that area to comply with its obligation to ensure the avoidance of technology discrimination, does ComReg accept that it is under and obligation to correct that mischief?**

**It is submitted that ComReg is under such an obligation.**

**Question: Does ComReg accept that if DCENR has incorrectly excluded all other wireless technology other than IMT LTE-Advanced as meeting NGA compatibility for the purposes of the NBP for example by misapplying the SAG, then a technology discrimination is taking place in an area within ComReg's specific remit? To be clear on the point, the European Commission only provides LTE-Advanced as an illustration of NGA compatible wireless technology and it appears that there are already other emerging compatible technologies *e.g.* Cambium Network's PMP450.**

**It is submitted a technology discrimination within ComReg's remit is occurring here and that ComReg is obliged to cease inaction and act to remedy this, not least in pursuance of its obligation to promote, where appropriate, infrastructure-based competition.**

**Question: Does ComReg accept that delay in proposing concrete replacements for the FWALA licenses could cause business uncertainty leading to lack of investment by license holders?**

**It is submitted that this is unarguable.**

**Question: Does ComReg accept that, after giving notice in 2010 of termination of the FWALA licenses in 2017, it has delayed in waiting until July 2015 before proposing possible replacements for the same?**

**It is submitted that this is unarguable.**

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**Question: Does ComReg accept that in delaying in this way ComReg has caused business uncertainty for both license holders and also among prospective applicants for FWALA licenses and or their successor replacements?**

**It is submitted that this is unarguable.**

**Question: Does ComReg accept that by delaying in this way in the face of the NBP proposals it has and is placing the future of such business at risk?**

**It is submitted that this is unarguable.**

214 A2.16 ComReg's obligation to have appropriate regard to Government policy statements and directions given by the DCENR Minister is noted.

**Question: Does ComReg accept that it would be obliged to act in a particular manner regarding the replacement of the FWALA licenses if so directed by the Minister for the DCENR?**

**It is submitted that ComReg would be so obliged.**

A2.17
&
A2.18 ComReg's observation that Policy Direction No.3 is less relevant currently is noted.

**Question: Does Comreg believe that because a particular State objective is not satisfied within a specified aspirational period Comreg is free to disregard it thereafter?**

**It is submitted that ComReg has no such right or authorization to disregard such a policy objective and therefore that Comreg's observation, aside from being inappropriate in the context of setting out its regulatory obligations, is an incorrect statement of its obligations.**

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Policy Direction No.3's three year period covered the period 21 February 2003 – 2006 and thus ostensibly did not cover the 2008 National Broadband Scheme ("NBS"), which, with the approval of the European Commission was State Aided to the tune of €78.9 million. It is submitted that its ostensible expiration in 2006 is irrelevant to the obligations of this policy, namely that ComReg was and remains obliged to take into account the national objective of the creation (and by definition, maintenance) of regionally balanced open-access affordable broadband infrastructure and services using existing and emerging technologies and speeds. By definition, a new technology offering higher speeds and or services could emerge at any time in the stated three year period, but merely because such emergence does not take place until, to take an extreme example, the last day of that specified period, cannot entitle ComReg to disregard it.

Accordingly, the fact that the 2008 NBS State Aid approval required, *inter alia,* the single successful tenderer *Three* to provide the services described in the European Commission's notification of State Aid approval[2] is relevant and is engaged with that policy direction. Since it has been alleged that the requisite NBS minimum requirements for end-user customers and the NBS open-access obligations were not complied with

2 State aid n° N 475/2007– Ireland National Broadband Scheme ("NBS")
"(14) Service definition: A service provider4 will be selected by means of an open tender and will be responsible for rolling out and operating electronic communications networks capable of providing broadband services. **The service provider will be required to offer subscribers in specified areas a retail connection with specific service requirements5. Moreover, there will be a requirement for the successful service provider to offer a wholesale product at an appropriate tariff, which will be available to other operators on the market on a non-discriminatory basis.** The Irish authorities have informed the Commission that the wholesale pricing will be set at a reasonable margin compared to the retail price to allow competition." [Emphasis added]

Footnote 5 to State aid n° N 475/2007– Ireland National Broadband Scheme ("NBS") states as follows:

"The service requirements are: always-on service (no charge by connection time); downstream (i.e. Internet to subscriber) speed of 1024kbit/s (1Mbit/s) whereby the service must allow minimum peak speeds up to 1024kbit/s; upstream (i.e. subscriber to Internet) speed of 128kbit/s whereby the service must allow minimum peak speeds up to 128kbit/s; a maximum contention ratio equivalent to 48:1(by reference to the technology employed by the Service Provider); minimum monthly limit on download capacity (uncharged) per retail subscriber connection of 10GB; latency requirements such that common Internet Protocol (IP), applications such as Virtual Private Network (VPN), Voice over IP (VoIP) and gaming may be supported by the broadband service."

either fully or at all, and since regardless of any such allegations it is notable that no other operators appear to have used *Three*'s network on a wholesale basis to provide any competing products, it appears incumbent upon ComReg to consider the relative successes or failures of the NBS scheme in relation to that policy direction so as to inform itself as to whatever market corrections may now be required.

**Question: Does ComReg accept that it is obliged to apply the obligations of Policy No.3 to assess whether the State Aided NBS fulfilled its obligations?**

**It is submitted that ComReg is so obliged.**

**Question: Does Comreg consider that the open access obligation in the NBS was complied with the resulting increased competition and improvement in quality and price of service for end-users, as was envisaged by the State and the European Commission when respectively applying for and granting State Aid clearance?**

**It is submitted that the objectives of the NBS in this regard were not fully realised.**

**Question: Does Comreg accept that if the objectives of the NBS were not fully realized Comreg is under an obligation to consider and assess the distorting effects that State Aid measure had on the rural broadband market and consider measures to remedy that distortion?**

**It is submitted that ComReg does have such an obligation.**

**Question: Does ComReg accept that FWA operators in both unlicensed and licensed frequencies may have been severely impacted by a lack of access to the infrastructure subvented with State Aid under the NBS by being thereby deprived of easily accessible affordable backhaul infrastructure?**

**It is submitted that ComReg must accept this possibility.**

**Question: Does ComReg understand that the NBP as presently proposed contemplates a gap-funded model like the NBS with a far larger tender being given to a single or small number of operators**

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**who will be made subject to almost exactly the same kind of obligations as under the NBS?**

**It is submitted that ComReg must be well aware of this fact**

**Question: Does ComReg accept that it is obliged to take steps to ensure *ab inito* that the same failures are not repeated?**

**It is submitted that ComReg is so obliged.**

214 It is noted that footnote 243 refers to 2010 DCENR spectrum policy statement. It would have been helpful if ComReg had set out its terms here.

215 A2.20 ComReg's obligation to ensure its regulatory decisions take account *inter alia* of the sustainability of the business of the undertakings affected Is noted.

**Question: Does ComReg accept that the FWA sector of the ECS market has been weakened and is now under severe threat as a result of (i) ComReg's delay in dealing with the replacement of the FWALA licenses and/or (ii) the NBP?**

215 A2.21 ComReg's section heading of its obligation here **"Policy Direction No5 on Regulation only when Necessary"** does not appear to capture then entirety of ComReg's obligations in the text of section A2.21.

ComReg's obligation in this section is not to impose regulations only when necessary. Instead, in situations where ComReg does not have to impose regulations, ComReg is obliged to consider (and by implication select, otherwise the obligation would be meaningless) whether not making regulations and the effects of market forces would achieve the objectives better than making regulations. This would appear, *prina facie,* to have a direct bearing on the method by which the 3.6Ghz spectrum is licensed, but the issue may not be so clear cut.

**Question: Does ComReg accept that its duties here include the reverse obligation, namely that ComReg also has a duty to consider whether the release of spectrum by controlled regulation would be a better way of achieving ComReg's obligations and/or objective than by letting market forces have their way in an auction process?**

**It is submitted that ComReg is so obliged.**

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215 A2.25 Comreg's key objective to focus on competition and its obligation to implement remedies to counter-act or remove barriers to market entry/support new players/entry into new sectors by existing players is noted.

**Question: Does ComReg accept that if FWA operators in rural areas have been disadvantaged by both or either (i) the failure of the NBS to provide transparent affordable open wholesale backhaul infrastructure access (ii) ComReg's delay in replacing the FWALA licenses from 2010 to the present this constituted a barrier of the kind described above in respect of which as a key objective ComReg is required to counter-act with a remedy?**

**It is submitted that this does constitute such a barrier and that ComReg is obliged as a key objective to implement remedies.**

**Question: Does ComReg accept that as a key objective to focus on competition ComReg has an obligation to support the FWA operators as existing market players in entry into the new NGA sector as is being pursued by the State's NBP?**

**It is submitted that ComReg has such an obligation**

**Question: In regard to the latter, why has ComReg failed to take the lead as the State's NRA in setting out on a technologically neutral basis in compliance with the SAG what constitutes NGA compatible wireless technology and thereby permitted DCENR to exercise ComReg's crucial role in this respect so as to exclude all except IMT LTE-Advanced thereby creating a barrier to market entry and reducing competition in the fixed wireless market?**

**It is submitted that ComReg should now take urgent steps to counter-act this barrier.**

217 A2.26 Comreg's obligation to manage, allocate and harmonise spectrum efficiently and effectively subject to directions issued by the DCENR Minister is noted.

**Question: Does ComReg accept that its management of the 2008 NBS and of ComReg's allocation, management and late proposals for replacement of the FWALA licenses could have been better?**

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**It is submitted that Comreg must answer in the affirmative.**

**Question: Does Comreg accept that, even if only by accident, by not ensuring that the NBS infrastructure was either not accessed at all or only minimally on a wholesale access basis by other operators ComReg has acted in a discriminative and distortive manner vis-a-vis the rest of the un-subvented market?**

**It is submitted that Comreg must answer in the affirmative.**

A2.27 Comreg's obligation to ensure that all types of ECS service technology may be used is noted.

**Question: Does ComReg accept that ComReg is obliged to define NGA compatible ECS technology in accordance with the SAG in such a way as to ensure that such definition is not restricted in Ireland to just one technology type namely IMT-LMT-Advanced?**

**It is submitted that Comreg is so obliged.**

A2.28 Comreg's obligation to restrict ECS network types or access technology *Inter alia* to avoid harmful interference, ensure technical quality of service, maximisation of radio frequency sharing, safeguard efficient use of spectrum and ensure a general interest objective as defined by the State is noted.

**Question: Does ComReg accept that Comreg is obliged to pursue these objectives in respect of both licensed and un-licensed spectrum?**

**It is submitted that Comreg is so obliged.**

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218 A2.31 It is noted that Regulation 17{6) requires that ECS can only be required to provided in a specific band if justified to fulfil a State specified general interest objective to include *inter alia* the promotion of social, regional or territorial cohesion.

**Question: Does ComReg accept that a major impetus behind the NBP to try and bridge the gap dividing higher speed broadband areas and no or basic speed areas (principally low population density dispersed rural areas) and that one of the major benefits asserted for the same is social, regional and or territorial cohesion?**

**It is submitted that this is irrefutable.**

219 A2.35 It is noted that Comreg is authorised to make rules to protect spectrum hoarding, as defined.

**Question: Did ComReg lay down such rules in respect of the 3.6 Ghz FWALA licenses and (i) if so with that result, and (ii) if not, why not?**

**It is understood that spectrum hoarding may have arisen in respect of FWALA licenses.**

221 A2.42 The circumstances in which ComReg is obliged to specify license assignability and the conditions thereof are noted>

**Question: What are the terms and conditions of assignability in respect of the proposed 3.6 Ghz licenses?**

**It is submitted that the assessment of potential value (and cost, which in the particular circumstances of the NBP, may be completely different) is made even more difficult without this information and that if these proposed licenses are to be transferable and assignable by lease the exact terms and conditions of such assignability should have been specified as part of this consultation.**

222 A2.46 Comreg's obligations, when granting limited numbers of rights for use of radio frequencies, to use objective, transparent, non-discriminatory and proportionate criteria relative to the relevant statutory objectives are noted.

**Question: Does ComReg accept that simply making license rights available by auction to the highest bidder facilitates larger market operators to the disadvantage of far smaller market operators?**

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**It is submitted that whilst an auction may well be the best way of obtaining the maximum payment for limited radio frequency rights, Comreg's obligations and objectives extend far beyond maximisation of revenue generation for the State from license sales.**

222 A2.48 It is noted that Regulation 19 permits ComReg to impose fees for licences.

**Question: Does ComReg accept that although ComReg can impose fees, it is not obliged to do so?**

**It is submitted that this is unarguable.**

**Question: Does ComReg believe that the highest price obtainable for a license ensures the optimal use of the spectrum?**

**It is submitted that such a belief is deeply flawed. For example, the fact that ComReg might sell FWALA licenses to a market operator with deep pockets who then does not use them may well be an optimal use of spectrum from the point of view of revenue generation by ComReg, but it is clear that that is not the kind of efficiency of spectrum use intended by ComReg's legislative obligations.**

A2.49 It is noted that ComReg must ensure fees are objectively justified *etc.* in relation to their intended purpose.

**Question: What is ComReg's intended purpose in issuing these licenses?**

**It is submitted that since ComReg has made it clear that ComReg believes its statutory remit gives ComReg *"no decision-making role in regard to the design of the NBP"*,[3] ComReg's objectives in issuing these licenses are by definition completely divorced and separate from the NBP and the NBP's intended and likely consequences for the FWA sector.**

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[3] *See* page 12 at 2.6

15 2.20 It is noted that the entire 3.6 Ghz band is licensed in Ireland, that the majority is licensed for FWALA services and that the FWALA licenses has facilitated WBB services across Ireland and been particularly beneficial in providing WBB services to rural Ireland.

16 2.25 Comreg's assertion about peak numbers declining in and from 2008 and the suggested reasons for this, namely increased competition *e.g.* from the State aided *Three* NBS are noted.

**Question: Does ComReg accept that the economic crash occurred in 2008?**

**Question: Does ComReg accept that the 2008 econokic crash could have played a significant part?**

**Question: Does ComReg accept that its own data collection process concerning the small but numerous operators in the FWA has, by design, been incomplete?**

**It is submitted that the answers to these questions are all affirmative.**

17 2.28 It is noted that ComReg is now consulting regarding the replacement of the 3.6 Ghz FWALA licenses in July 2017.

**Question: On the basis that Comreg's key objective to focus on competition and its obligation to implement remedies to counter-act or remove barriers *inter alia* to support entry into new sectors by existing operators, does ComReg accept that it has not acted in a manner conducive to business certainty for existing FWA operators seeking to qualify as NGA compliant for the purposes of the NBP?**

**It is submitted that this is unarguable.**

24 3.22 ComReg's statement that the LTE device ecosystem for the 3.6 Ghz band is not well developed is noted.

**Question: Does ComReg believe this to be the case so far as the fixed wireless broadband sector is concerned?**

**Question: Could ComReg explain why the DCENR has identified IMT-LTE-Advanced as the only NGA compatible fixed wireless technology?**

28 3.32 ComReg's aim to design and implement the 3.6 Ghz pursuing *inter alia*

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the broader objective of promoting competition is noted.

**Question: Does ComReg make this statement from solely the narrow perspective of promoting competition (i) for these 3.6 Ghz licenses or more broadly (ii) in the entire fixed WBB sector, or (iii) in the fixed and mobile WBB sector, or (iv) the entire broadband sector (*i.e.* all technologies)? The reason for asking this question is because the course adopted to promote competition may differ depending on whether ComReg's focus here is narrow or broad?**

**It is submitted that ComReg's focus here should be on promoting competition on one of the broad options above, not the narrow one.**

3.33 ComReg's further key objectives are noted but it is to be observed that its ultimate aim of maximizing benefits for consumers in terms of price, choice and quality is not best realized by implementing measures designed to maximize competition and the price obtained for the 3,6 Ghz licenses.

**Question: Does ComReg believe that obtaining the maximum price possible for the 3.6 Ghz licenses would maximize benefits for consumers and if so which consumers?**

**It is submitted that if ComReg implements a process designed to maximize the license price and is successful in attracting bids from market operators with the deepest pockets, on any reasonable view of the potential auction audience (small FWA operators or large mobile operators) the latter will prevail to the benefit of dense urban population use and the corresponding (and dramatic) dis-benefit of the already sparsely served rural hinterlands.**

30 3.41 **Would ComReg please explain why the perceived preferences of industry stakeholders is relevant to ComReg's objectives and to what extent, especially given ComReg's attitude already expressed in relation to disruption to existing FWALA customers' service?[4]**

32 3.49 ComReg's recognition of the importance of clarity and certainty as early as possible about the availability of spectrum and the negative effects on competition are well made.

**Question: Does ComReg accept that such uncertainty and negative effects have already occurred and if it does not do so, does ComReg wish to receive submissions about the extent of this disruption to the market?**

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[4] at 3.34 above.

34 3.62 When ComReg discusses competition here and elsewhere in this consultation it is not clear whether ComReg is referring to it in the sense of competition between operators in the supply of their services to customers, or in the sense of competition between them for the purchase of licenses, because the two are completely different and it is far from clear that ComReg is referring to the former sense..

**Question: Please clarify in which sense ComReg is using "competition".**

3.65 ComReg's general assumption that *"what is good for competition, and what promotes investment in infrastructure, is, in general, good for customers"* is noted, but there is no supporting data of any kind offered in support of this far-reaching claim.

**Question: Does ComReg accept that if ComReg designs a process to drive the price of licenses up to the maximum the wealthiest operators (i) smaller operators will be driven out of the market (ii) competition can thereby be reduced and (iii) the cost will be passed on to consumers in the end?**

**It is submitted that ComReg cannot rely on this general assumption without wide-ranging market data appropriate to a wireless sector of this nature.**

35 3.66 ComReg's expression of concern about providing greater certainty to existing end-users is misplaced.

**Question: Does ComReg accept, as the evidence shows not least in the reports produced by or referred to in the NBP documentation, that end user consumers could not care less as they would switch in a heartbeat to a better service at the same price or indeed the same service at a lower price?**

**It is submitted that ComReg is in error here.**

36 3.77 ComReg's observation about a comparative award ("beauty contest") being useful if there is a particular objective in mind is noted, as is Comreg's counterbalancing fixation about setting usage fees at the right price.

**Question: Does ComReg accept that the preservation and promotion of the existing and future FWA sector is a legitimate objective worth**

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**pursuing, particularly in view of the likely effect of the NBP on this sector of the market?**

**Comreg's discretion about charging usage fees has already been noted above. It is submitted that Comreg should dispense with its short range concern on the narrow issue of raising fees from what is by reference to other spectrum a modest band and focus instead on the harm already done to the market and the means of redressing and promoting it.**

37 3.80 Comreg's arguments here are noted, but it is submitted that these are fallacious. ComReg's concerns about picking incorrect technologies *etc* when making administrative awards lead to the conclusion, in the present FWALA case, that having choked the FWA sector almost to a standstill with the uncertainty ComReg has created since 2010 and done nothing to allay since then, ComReg is now promoting a concern about other as yet unknown formats as a reason for rejecting administrative awards, *i.e.* ComReg is not being neutral.

3.81 ComReg's keenness to obtain the maximum price possible through an auction process is noted, as is ComReg's observation that the bidder with the deepest pockets will win. However, if that process simply enables a large operator or operators to become even more dominant in the market, far from having a positive effect on competition it has exactly the reverse effect. For this reason it is submitted that ComReg's analysis here is flawed.

3.82 ComReg's belief that obtaining the highest price in an auction process is the most efficient assignment of licenses is noted, as is ComReg's belief that this in turn promotes competition in the downstream market to the benefit of consumers and that that using an auction removes much of the risk of the regulator making incorrect decisions. However, this is only true if the regulator uses a completely shallow judgment basis. Also, by abandoning the outcome to a highest bidder process the regulator enables itself to avoid having to make the tough decisions it was out in place to adjudicate.

38 3.86 ComReg's issuance of a notice in April 2010 that the FWALA licenses would be withdrawn in 2010 is noted, but it is one ting to withdraw spectrum from existing spectrum holders and quite another to do so without offering overlapping alternative until almost the last second, in terms of investment and planning, before midnight.

39 3.87(iii) ComReg's assertion that the weight of the FWALA responses did not

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support the continuation of a local areas licensing approach is noted.

**Question: ComReg is requested to explain the basis upon which ComReg reached this conclusion, the reasons provided by the FWA sector as to its undesireability and why Comreg believes the current model was defective?**

41 3.92 ComReg appears to recognize here that unless current license holders can be certain of remaining in band they will already have had to make plans to or already have invested elsewhere before the end of the existing licenses and that they therefore will not get the full value of their licenses and the infrastructure in which they have already invested to use those licenses.

**Question: Does ComReg accept that its actions have already caused disruption to existing FWALA license holders?**

3.93 It is noted that ComReg considers new entrants *"would likely prefer"* an auction process over an administrative assignment because the latter process would reduce the amount of spectrum available for new entrants and drive up the price. The problem with this analysis is that it assumes that existing rurally based FWA operators and likely new entrants (large far better resourced mobile network operators) operate on a level playing field. The reality is that the MNOs already have a distribution platform for delivery of broadband services and this spectrum would merely be an adjunct to those existing services, where as rural FWA operators have no other means of delivering broadband services. As a result, the expenditure of relatively small amounts of money (in comparison to the resources of large player MNOs) will enable them to outcompete the resources of the far smaller FWA players and thereby eradicate the FWA sector from providing any competition to and with them, with the consequent adverse effect on end-users choice etc.

**Question: Does ComReg accept that likely new entrant MNOs already have a distribution platform for delivery of broadband services and this spectrum would merely be an adjunct to those existing services, where as rural FWA operators have no other means of delivering broadband services?**

3.95 It is noted that ComReg sets up a hypothesis that new entrants *"would also"* like an administrative assignment process if it mean that all of the spectrum was reserved for new entrants only. Presumably this is meant to demonstrate that as any one group of likely bidders, be they existing FWA rural wireless broadband providers or new entrants, would prefer

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administrative assignment over auction process, the two cancel each other out and for that reason an auction process is fairer as it gives both sides an equal chance. However, that premise makes the same assumption as is explained re 3.93 above and is flawed for the reasons provided in the comments on that section.

**Question: Does ComReg accept that each constituency as envisaged in the assignment process is not starting from a level playing field and that one element, namely the existing rural broadband FWA operators, are dependent on the spectrum for their survival in the marketplace, whereas new entrant MNOs (i) do not and (ii) are likely to be far better financially resourced?**

42 3.98 ComReg's low ranking (in terms of importance) of competition between enterprises interested in obtaining award of spectrum as against ComReg's higher ranking of competition between holders of spectrum in providing services to end users is noted, as is ComReg's statement that the latter is the *"primary goal"* driving this proposed award process because *"competition a retail level is ultimately what drives consumer benefits."*

**Question: Does ComReg accept that (i) if the award of spectrum by action (of any kind) can be demonstrated to have a negative effect and or (ii) that an administrative award would have a better effect - on competition at a retail level, then the administrative award model should be preferred – even if (iii) this means that the revenue derived from the sale of spectrum is lower?**

3.99 ComReg's concern that the "optimal assignment" is correlated with achieving the highest possible price for it is noted. Even if ComReg is correct, which is not accepted, ComReg thus has a stark choice – to go for the money to the detriment of its stated primary goal, or to accept that a lower than fully realizable price is the better way of fulfilling that primary goal.

**Question: Does ComReg accept that if a lesser price is the better means of achieving ComReg's primary goal then ComReg is obliged to adopt that course?**

3.100 ComReg's statements that (i) "efficient assignment is best obtained by sale at "opportunity cost" (ii) assignment below "opportunity cost" equals "inefficient assignment" because it is less than highest price that the highest bidder would pay (iii) other potential users would be disadvantaged "because the spectrum is not assigned at the highest price to those prepared to pay that highest price – are all noted and wholly

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rejected. This attempts to equate efficiency with the highest price in the absence of any empirical evidence targeted at the particular circumstances of this case.

**Question: Does ComReg accept that is has provided absolutely no empirical evidence targeted at the particular (and possibly unique) circumstances of this case which supports Comreg's assertions as set out above?**

43 3.101 ComReg's lack of information about the business, both present and future, of the present FWA sector is noted, as ComReg's statement that as a result ComReg has difficulties making accurate assessments. It is submitted that any such data deficiency is entirely ComReg's own fault and completely capable of cure - simply by the regulator asking them.

**Question: Has ComReg asked the existing FWA operators for the information Comreg lacks?**

**It is submitted that the answer is in the negative. It is further submitted that ComReg's own failure to collect data vitally necessary for ComReg to make a balanced reasonable decision is no basis at all on which to reach a conclusion. ComReg is the regulator – if it wants this information, it has only to ask. It is submitted that in the face of market annihilation ComReg will have no difficulty in obtaining the information ComReg states it requires.**

3.103 ComReg's analysis here is noted, but with the greatest of respect it conducted on a completely false premise. There is an intrinsic difference between the existing FWA sector and the MNO's ComReg hopes to attract into its auction process. The FWA sector, including both existing license holders and those presently without licensed spectrum, have no choice - under the terms of the NBP as presently proposed by DCENR – but to purchase licensed spectrum if they wish to qualify for the purposes of providing NGA services and thereby avoid annihilation from State Aid subvented FTTH. ComReg has completely ignored FWALA license-holder Ripplecom's comment (which ComReg set out in section 3.91) namely that a significant proportion of spectrum should be reserved generally for rurally focused WISPs to deliver NGA speeds. It is to be noted here that this existing incumbent was not seeking spectrum to be reserved just for itself, nor just for all existing incumbents, but for all FWA market players.

**Question: Does ComReg accept that unless all existing FWA market operators have easily accessible affordable access to spectrum in this**

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**process then they will not be able to provide NGA services and continue in business?**

43 3.104 ComReg's assertion that the auction format reveals information about the most valuable uses is not accepted in this case, because what is "valuable" to the different market players is dependent upon their subjective views. What is "valuable" to a large well resourced market player could be completely different to what is valuable to a small market player trying to remain in business in the face of being wiped out through administrative State Aided process. *"Incentivising bidders to express their willingness to pay for spectrum"* is an oft repeated mantra of ComReg's throughout this consultation, but it is simply another way of saying "getting the highest price" There is no lack of willingness on the part of the FWA sector to continue in business, but if they cannot afford the price of spectrum because ComReg has deliberately designed a process intended to drive the price to the highest levels achievable then their "willingness" to purchase cannot be expressed.

ComReg's assertion that getting the highest price through the auction process efficiently limits distortions to competition is rejected. Such an auction process enables big players to crush smaller players thereby making this assertion completely wrong and demonstrates a fundamental misunderstanding of how unregulated markets can operate if left un-regulated.

3.105 ComReg's preliminary view that an auction process would better promoted competition is thus wholly rejected.

3.107-8 Once again ComReg's assertion that the highest price extracted for spectrum is most likely to produce "an efficient outcome" is rejected and for the same reasons. It is not clear where ComReg is going with its "efficient outcome" mantra. All this means is the highest price and there is little disagreement with the proposition that an auction process appears most likely to deliver that. But the highest price is neither the beginning nor the end of the considerations ComReg is required to address under its statutory obligations. As stated above, the fact that someone pays the most for something does not necessarily mean that they valuing it the most – it just means that they are able and are prepared to pay more for it than someone else, regardless of its true value.

**Question: If, as stated above, the effect of ComReg's preferred process (auction) is to drive a section of the market out of business, does ComReg accept that this would not deliver the best outcome in terms of competition in the market at retail level?**

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| | | **For the reasons stated, it is submitted that ComReg's preliminary view here is flawed and that ComReg is in error here.** |
| 44 | 3.109 | ComReg's reliance on the possibility future market developments in this spectrum, about which it accepts it has little transparency, is noted and is contrasted with ComReg's stated lack of information about the services the FWA sector presently does and is likely to provide to end-users, about which ComReg has not troubled to enquire. The former is unrealized and aspirational, the other presently exists and is certain. The fact that ComReg is selecting the interest of the former over the latter is *ipso facto* unreasonable and unsupportable. |
| | 3.110 | ComReg's assessment that operators' efficiency is to be measured by their ability to pay the highest price is noted and, because it is *prima facie* untrue, rejected. ComReg's excuse of having asymmetric information is, as stated above, a problem entirely of ComReg's own failure to seek it and forms no basis of any reasonable kind for reaching the conclusions that Comreg has reached. |
| | 3.111 | ComReg's concern that an administrative award could create the impression that the Irish market favours pre-determined bidders is noted, but rejected. Protecting existing competitive elements to continue in business while allowing other in to compete is not a barrier to entry. ComReg does not have to wipe out an existing business sector so as to create a level playing field for all persons wishing to enter it. |
| 45 | 3.112 - 3 | ComReg sets up a wholly artificial comparison between reserving spectrum for existing FWA market players (an note, not just existing FWA license holders) and reserving it for new entrants. That artificiality extends to the fact that nowhere has anyone suggested that "new entrants" will include new entrants to the FWA market. Accordingly "new entrants" will only comprise persons wishing to use the spectrum for reasons other than FWA WBB service in rural areas. ComReg then proceeds to assert that the most efficient outcome (*i*.e. the highest price) would mean spectrum assignment to those who *"can generate the greatest benefits to society" from its use."* The problem with this declaration is that it is wholly unsupported by any empirical evidence targeted at the peculiar circumstance prevailing regarding this spectrum. It is completely unsupportable to assert that a person who pays the most will create the greatest benefit for society. For example, consider selling off a monopoly product to the highest bidder. The winner will then be free to extract the maximum value without any competition. |

3.114 - 5 ComReg's recognition that bidders might "value" spectrum by reference to their ability to drive out competitors is to be applauded, as is ComReg's recognition that this would reduce competition and choice for end users and drive up price. ComReg's panacea of tailoring the auction process, *e.g.* by having spectrum caps *etc* is noted but rejected and completely inadequate for the simple reason that even if licenses have to be surrendered after a number of years for non-use, the damage to the FWA sector will already have been done.

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45 3.116 ComReg's opinion of what end user consumers prefer is interesting in a number of respects. In the first place, in the main there is a complete dearth of input from such consumers. In the second place, ComReg's substitution of its own opinion of what consumers *"should"* prefer is no factual basis of any kind on which to base a conclusion. Furthermore, even if ComReg's assumption(s) is/are correct, such preferences would need to be based on a clear understanding of the issues and an ability to predict future outcomes which, with respect, not even ComReg possesses. The one issue which ComReg does accurately identify, is disruption.

**Question: On the basis that the SAG requires ComReg (i) to take into account spectrum (re-)allocations leading to possible network roll-out in the NBP's target areas that could achieve the NBP objectives without State Aid and on the basis and (ii) to play an important role in designing a pro-competitive State aid measure in support of broadband, does ComReg accept that if an FWA operator cannot obtain licensed spectrum to supply NGA services, then its coverage area will be included in the NPB Intervention area?**

**It is submitted that the answer here is unarguable.**

**Question: Assuming the answer is in the affirmative, does ComReg accept that all things being equal that such FWA operator will quit the WBB market?**

**It is submitted that the answer here is unarguable.**

**Question: Assuming the FWA operators in such a position are prudent businesses, does ComReg accept that such operators will be unable to obtain funding for their networks reaching beyond NBP intervention rollout and that they will therefore cease operations well before such rollout?**

**It is submitted that the answer here is unarguable – namely that they will have to do so.**

**Question: Assuming the answer is in the affirmative, does ComReg accept that the result of such a process is that consumers of WBB services in rural areas (often the only WBB service) will for a time be even worse off than at present for the period between such FWA operator's shutdown and the realisation of political promises to replace the same with FTTH?**

**It is submitted that the answer here is unarguable, namely that there will be such an hiatus and worse service including none, for an as yet indeterminate period due to the nature of vote-catching political promises given by the incumbents in a pre-election period.**

**Question: Does ComReg accept that this would be disruption of the kind which it should do all in its power to avoid, especially in light of its obligations under the SAG to use its spectrum re-allocation powers to take steps to ensure State Aid is not necessary.**

**It is submitted that it is and that Comreg should so act because ComReg is so obliged.**

**Question: If the greatest potential to promote competition and increase consumer welfare in the rural low population density areas and which are less well served that urban areas is to avoid a process which annihilates the FWA WBB sector, does ComReg accept that (i) that is the option consumers should prefer and (ii) ComReg should avoid that competition-destructive process.**

**It is submitted that consumers should make that choice and that Comreg should avoid such a destructive course.**

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| 45 | 3.117 | **Question: Does ComReg accept that it must follow from the above that if Option 1 (auction) is not best for competition between service suppliers then it is not best for end-user consumers either?**<br><br>**It is submitted that this must be the case.** |
| 46 | 3.117 | ComReg's assertion that the higher the price paid for spectrum the more consumer welfare is maximized is noted and rejected. By definition, the higher the price for spectrum the more consumers will end up paying for services supplied using it, one way or another. |
| | 3.118 – 3.120 | ComReg's remarks in these sections (replate with conditionalities) are |

noted with surprise and are rejected. In particular, ComReg's arguments appear to comprise a prayer[5] to the future based on the premise that uncontrolled market forces will always provide the most good. Such a premise, at least in its broadest terms, is demonstrably untenable and in essence appears to be being put forward by ComReg as a means of avoiding making the difficult value-judgments and hard decisions which it is a regulator's duty to make.

The surprise arises with ComReg's unacceptable suggestion(s) that (i) FWA network operators are by definition inefficient (ii) an administrative award to such network operators would be a reward to inefficiency (iii) that it would *per se* constitute a restriction on the current competitive process, and in particular with (iv) namely that incumbent FWA license holders would delay network upgrades.

**Question: Has ComReg read the State's Consultation papers and Calls For Input during the NBP process from 2012 to the present?**

**It is submitted that if ComReg had done so, or if it had paid attention to the implications of the NBP for the FWA sector, it could not rationally have made such suggestions.**

**Question: Does ComReg not understand that if a FWA operator fails to provide DCENR with concrete plans including *inter alia* as to funding guarantees, equipment specification and performance, cash flow projections *etc.,* then its coverage areas will be included in the Intervention Area and that will be subvented for FTTH thereby wiping it out?**

**In the circumstances, it is submitted that ComReg is wrong to suggest that FWA operators would fail to use such spectrum if allocated to them.**

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3.121 ComReg's suggestion that transition rules for existing incumbents will deal with service disruption to existing FWALA operators during the auction process completely misses the point. The incumbents need the spectrum now, not at some unspecified time in the future.

3.122 ComReg's observation that customer disruption will not be an unmanageable risk under its proposed auction as long as incumbents pay the highest price for licenses is noted, but is fantasy for by definition if an incumbent cannot pay the highest possible price arising from a process deliberately designed by ComReg to elicit, then by definition there is a

[5] Colloquially, a "Hail Mary".

very severe risk of customer disruption. An additional point which ComReg appears to have completely missed is that as proposes the only certainty existing incumbents and the FWA sector have in this as yet totally uncertain process is that they are facing paying the maximum sums ComReg can wring out of them.

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| | 3.123 | ComReg's comments are noted here but prompts the question as to whether ComReg knows anything at all about the sector to which ComReg issued the FWALA licenses starting more than a decade ago for the purpose of rolling out broadband into rural regions where big market operators would not venture. The question of whether demand will exist is intricately tied up with the NBP process, to which ComReg so far appears to be turning a Nelsonian eye. And the suggestion that new FWA entrants would replace less efficient operators in providing rural areas with services at the drop of a hat appears unrealistic given that existing FWA operators have had to engage in a process over many years to locate and provision a multitude of private high site transmission points contracted for with, in many cases, private landowners and on the basis of personal relationships built up over a course of years. Un-informal as this may appear, this is frequently the reality on the ground and the result is that no entrant is simply going to be able to walk in and take over at the drop of a hat, as ComReg appears to think would occur. |
| 47 | 3.124 -5 | ComReg's recognition that the FWALA market comprises a large number of small operators serving a diverse range of local regional and national geographic regions is welcomed. Given that knowledge it follows that ComReg should be aware that the remainder of the FWA sector (using unlicensed spectrum and now needing urgently to be able to produce business plans etc proving the provision NGA services using licensed spectrum) serves a similar diversity. Less welcome is ComReg's reliance on its own failure to inform itself as a basis for not knowing how well any new FWA entrant competitors might compete as a reason for avoiding administrative spectrum allocation.<br><br>Of particular note however is ComReg's recognition that it *"would be particularly damaging to consumers if the reservation of spectrum for new entrants caused more efficient incumbents, who provide service currently where demand exists, to exit due to an artificially high price of spectrum or lack or suitable spectrum."* It is clear that ComReg thus accepts, at least in principle, that ComReg's actions in relation to this spectrum could have a *"particularly damaging effect to consumers"* by forcing incumbents to exit the market, but the problem is that ComReg is looking at the problem from the wrong way round. |

In part the problem is, as the State has pointed out recently in its NBP proposals, that ComReg simply has not bothered to collect data in respect of the market it is regulating.[6] Only at the end of 2014 and after ComReg's previous consultation at the end of 2014 did it become apparent both to ComReg and DCENR from a press release (dated 13 January 2015) issued by ISPAI that the FWA sector was much larger than ComReg's data indicated. That lack of relevant market data coupled with ComReg's bald admission that it lacks the data to make a determination about an administrative assignment of spectrum here due to the fact that ComReg has not bothered to collect it, appears on its face to fatally undermine the reasonableness and perhaps even the lawfulness of ComReg's approach in this consultation.

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| 47 | 3.127 – 8 | ComReg's summary is noted but rejected for reasons explained above. ComReg sets up the artificial hypothesis that new entrants would like spectrum as though it is a serious and matching counter-balance to the reasonable claims on behalf of the entire FWA sector (not just the FWA incumbents) that spectrum be made available for that sector so as to prevent it from being totally destroyed with the corresponding loss of competition in already sparsely served areas in rural Ireland. ComReg then sets up the argument that because ComReg believes that neither side of that artificial equation would prefer the other to be given reserved spectrum, both would prefer the auction process.<br><br>**Question: If ComReg thought that there might be merit in providing reserved spectrum to either the FWA sector or new entrant, does ComReg accept that it could take an action it has not put on the table in its considerations, namely to reserve an portion of spectrum (to serve WBB services in rural areas) for both sides of the equation?** |
| 48 | 3.129 | ComReg's conclusion that an auction process is the best option is not accepted for the reasons stated. . |
| | 3.130 | **ComReg's references to reflecting *"the value of retaining spectrum for future use"* and allowing the full band to be used *"if there is strong demand"* and ensuring spectrum *"is only assigned if its value…is sufficiently high relative to the value of retaining spectrum for future assignment"* are noted, with surprise. From this small throwaway paragraph it appears to be the case that ComReg, even though** |

[6] PwC's NBP Ireland – State Aid Compliance Report, page 10 states "The ComReg data suggests that 12 FWA operators3 provide broadband to 48,486 subscriptions. However, ComReg collects data only of FWA operators who have a certain financial turnover. In fact, there may be as many as 80 FWA operators in total4, particularly in rural areas. The total number of subscriptions might be as high as 150,000, of which approx. 125,000 in rural areas"

**pinning its hopes on letting the auction process set the market value of the spectrum so as to realise the highest prices possible, ComReg is also reserving the right not to sell the spectrum in that auction process if ComReg believes that spectrum might be worth more at some time in the future. In other words, it would appear from what ComReg states here that bidders will be playing against a stacked deck.**

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| 48 | 3.131-3 | It is noted that at this point what was until now ComReg's preliminary view in the Consultation has been transformed into "the Preferred Option". Those making this submission had understood this process to be a consultation, not a definitive statement of Comreg's determination prior to ComReg receiving any input from those submitting comment, because this gives the impression that ComReg's mind is already made up regardless of what consultees might have to say.. |
| 49 | 3.134 | ComReg's stated objectives in performing its RIA are noted, namely of (i) promoting competition (ii) ensuring no distortion/restriction of competition whilst simultaneously encouraging investment in infrastructure, promote innovation and ComReg's of-repeated mantra of ensuring efficient use and effective management of spectrum, to create maximum consumer benefit by reference to choice, quality and price. The difficulty here is that ComReg's Preferred Choice is the worst choice to meet those objectives. |
| | 3.135 - 6 | It is noted that ComReg does not at this point make any reference to its obligations under the SAG. It is therefore difficult to see how ComReg's analysis can be anything other than fatally flawed. |
| 50 | 3.137 | In relation to competition, for the reasons explained above it is submitted that ComReg's choice is anti-competitive not least because it means that the existing FWA sector does not have immediate affordable access to spectrum by which it can guarantee to the State that it will roll out NGA services over the next five years. That will mean the destruction of that sector with a resulting loss of already sparse services and competition in rural areas. Far from promoting competition and avoiding distortion/restriction of competition, ComReg's strategy is, deliberately, precisely to create this un-desireable state of affairs. It also flies in the face of ComReg's obligation to play an important role in the design of the NBP (for example in ensuring compliance with the SAG and *e.g.* a correct definition of NGA services) as well as its obligation to reallocate spectrum where necessary so as to avoid the need for State Aided schemes. |
| 51 | 3.141 | ComReg's reference to avoiding administrative allocation due to the |

effects where there is excess demand for spectrum is noted, but nowhere in its consultation has ComReg demonstrated that there will be such excess demand. Indeed, if ComReg truly believed there would be excess demand ComReg would not have reserved for itself to withhold spectrum where it believes the auction prices achieved will not be high enough (see 3.130 above)

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| 52 | 3.142 | ComReg's reference to having had due regard to the views of the European Commission in relation to this consultation, but it is noted that ComReg has not published such valuable guidance and input. For the sake of open and transparent process ComReg is accordingly requested to publish all such input from the European Commission in relation to this consultation. |
| 53 | 3.144 | It is noted that at this stage of the consultation in this section that ComReg has conclusively determined, heedless of input from those responding to this consultation, that *"administrative assignment of rights to use critical spectrum to incumbent operators" " would restrict or distort competition otherwise unfairly discriminate against potential entrants."* It is submitted not only that ComReg is mistaken in this conclusion but also that as a matter of administrative process ComReg is wrong in principle to have made such a conclusive determination before receiving the views of those consulted not least because it suggests that the consultation is a sham with ComReg set on a predetermined outcome. Nowhere has ComReg given consideration to the alternative option of reserving spectrum both for incumbents wishing to renew and for new entrants from the FWA sector obliged to access this spectrum and, if appropriate, auctioning the remainder for new entrant MNOs or other as yet unidentified potential new users of this spectrum. It is also observed that in reaching this conclusion ComReg continues to fail to note that incumbents want some of the spectrum reserved not just for themselves, but for all members of the FWA sector precisely because the NBP as presently proposed threatens to annihilate them unless they have more or less immediate access to their spectrum on affordable terms. |
| | 3.145 | The point has already been made above in relation to ComReg's comments in this section, namely that as a matter of general principle one does not have to destroy an existing market in order to crate a level playing field for new entrants. |
| | 3.147 | With respect, ComReg's claim here to having had clear regard to promoting the provision of WBB services is simply not consistent with the reality of what ComReg has done in the management of the FWALA licenses and what it proposes in this consultation. |

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| 54 | 3.149 | ComReg's assertion that ComReg's Preferred Option is consistent with other Member States' approaches is noted, but that would require such other Member States to have a similar broadband ecology to that of Ireland. Given that Ireland's broadband ecology is considered relatively unique so far as the development of WBB services to provide broadband to Ireland's low population density rural areas is concerned, ComReg is requested to set out exactly which other Member States' approaches ComReg is referring to here? |
| 54 | 3.154 | It is noted here that whilst ComReg identifies ComReg's Preferred Option (which is not agreed) is one which would safeguard the interests to which ComReg refers, it is not the only available option. |
| | 3.156 | ComReg's belief stated again here that those who pay the most for spectrum are those most likely to use it most efficiently is rejected and it is submitted for reasons already explained that it is misplaced in the circumstances of this particular spectrum, its importance to the FWA sector, sparse rural broadband services and the imminent NBP. |
| | 3.157 | ComReg's view that the Preferred Option is the only option is noted, but rejected for reasons already explained. |
| | 3.158 | It is submitted that ComReg's management of the FWALA licenses and ComReg's delay in arriving at concrete means for their spectrum's reallocation has been the precise antithesis of promoting regulatory predictability. Having issued FWALA licenses on an administrative assignment basis ComReg now chooses, after a very long delay, a completely different approach and one in which the only regulatory certainty appears to be that ComReg will strive to do its utmost to obtain the highest possible price and if insufficient will withdraw and reserve spectrum until some future unspecified time when ComReg feels it can obtain this.<br><br>As to promoting efficient investment etc, by not enabling the FWA sector to upgrade their networks to NGA services ComReg is doing precisely the opposite. It is thus simply not the case, as ComReg claims, that ComReg has taken due account of the variety of conditions relating to competition and consumers that exists in the various geographic areas in Ireland. Where and how in this consultation has ComReg accounted for the geographic and other conditions of the FWA sector? The answer is nowhere, and the reason is because ComReg simply has not bothered to collect the data. ComReg's process and its choices as evinced in this consultation are thus flawed. |
| | 3.161-2 | ComReg's desire to ensure future spectrum assignment is known as soon |

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as possible so as to achieve regulatory predictability, but in its delaying reaching this stage ComReg has already long since failed in this obligation, for the reasons already explained. ComReg's denial to itself of relevant market information and ComReg's subsequent use of that self inflicted handicap as a basis for justifying another course has already been explained above and for those reasons is both wrong in principle and in practice. Moreover, ComReg's reference to the fact that mobile operators, post the MBSA, are becoming familiar with competitive auction processes illustrates the degree to which ComReg appears to have little or no interest in the interests of the FWA sector, which by virtue of ComReg's management of the FWALA licenses to date has not such experience and, being far less well resourced that large MNO players, will be far less well able to cope with such a process.

57 3.165 The statements made by ComReg in this section are not accepted.

58 3.170-4 For reasons explained at the beginning of this submission (see A2.17 – 18 above) it is submitted that the purposes and intent of this policy objective remain as valid today as they were when issued, especially because the State has not withdrawn this Policy Direction. At section 3.174 ComReg once again demonstrates its total incomprehension of the effects of the proposed NBP on the FWA sector and why this has created the most enormous incentivisation fort the FWA sector to roll out NGA services.

3.177 ComReg's mischaracterisation of what the policy direction states here is noted and rejected. The words mean what they say. Those words say: *"the impact of such decision* ***on the sustainability of the business undertaking affected****"*. [Emphasis added] ComReg's failure to address the likely effects of its proposals on a market sector about which ComReg has not bothered to gather adequate data and thus cannot account for or consider properly is noted.

Preliminary Conclusion

Unfortunately shortage of time has not permitted a complete consideration of and comment upon the entire consultation document in this submission. That said, the essential themes appear to have become clear as follows.

It appears to be the case that ComReg has little knowledge of the market it has been serving in respect of the FWALA licenses nor of its obligations under the SAG to make use of them to try and avoid the expenditure of State Aid funds where re-use of spectrum could achieve the same objectives – here the providing of NGA services to the dispersed low density rural population.

ConReg's argument is by achieving the highest price possible for the licences (and for that purpose using a process designed for far more lucrative spectrum sold for mobile telephony and data services to far larger and better resourced market players, ComReg will achieve the most efficient use of the spectrum. ComReg's argument is that by definition the person who can pay the highest price will ipso facto be the most efficient user of that spectrum, that that will be the most competitive supplier of services to end users and that therefore end users will be give the widest possible choice, competition at the most competitive of prices.

Essentially this appears to comprise a red-blooded market-force based approach based on the belief that if ComReg allows unshaped market forces to have their way that will automatically produce the best outcome in terms of use of spectrum and competitive services for end users.

What is interesting about this approach is that ComReg itself accepts that there may be (and only may be) two markets for this spectrum namely the relatively small SME FWA incumbents and large mobile operators. Surprisingly, ComReg does not appear to know that as a result of the NBP, in which ComReg professes to have no role, the entire FWA sector, not just the FWA incumbents, have an immediate pressing need to access spectrum in order to survive. The MNO market, in ComReg's own estimation, will most likely use the spectrum for a completely different purpose, not so much as a frequency to provide direct services to customers but as a backhaul adjunct to its exiting backhaul so as to be able to augment its exiting mobile services and possibly also for direct services to customer in high population density areas.. From this it can be seen that there are two completely different needs here. The mobile wireless sector is already well developed, is under no threat and already provides strong competitive services across the country. However, mobile wireless broadband is not accepted as adequate to provide NGA and ultra fast broadband services quite simply because it cannot support high downloads without consumers facing high charges. The other market in contrast serves sparsely serviced low population density numbers in almost exclusively rural areas. Accordingly in considering ComReg's stated principal objective of competition in services provided to end user customers without any consideration or taking into account of that fact that one market has very little robust competition and is served by home grown SMEs developed

with State encouragement by the Group and Commumit8y broadband schemes in the early 2000's precisely because the large market operators had no interest in servicing such low return areas, ComReg is not comparing like with like nor is it considering the needs of those least well serviced areas. Furthermore, ComReg is adopting this approach, on its own admission, totally in isolation from and indifferent to the NBP which is proposing to address the low level of services in rural areas through a State Aided Plan to try and remedy the deficiency,

What is interesting about ComReg's consultation document is that nowhere does it contain any comprehensive overview of the market sector it presently serves (the FWA sector) not least because on its own admission ComReg has not bothered (i) to collect data from FWA operators less than a certain size nor (ii) to ask either FWA incumbents nor the FWA sector market operators for the information it lacks. The result therefore appears to be a totally uninformed, misplaced and skewed process in which it appears apparent that rather than engage with the problems posed to the sector by ComReg's failure to take leadership and provide investment planning and certainty at the earliest possible opportunity, ComReg has dallied and toyed with the idea of selling off this spectrum together with other frequencies to see if large market operators could be attracted once again to pay large sums for the same, and then when disinterest was evinced, proceed to continue down the same MBSA auction type route to continue to try and raise the largest amounts possible regardless of the fact that by setting the stage in that way the FWA sector's already difficult situation as created by ComReg's delay and the threats now posed by the NBP would be made even worse.

Accordingly we call on ComReg to pause,to consider its SAG obligations and to reallocate the spectrum on an administrative basis both to existing incumbents and to the remainder of the FWA sector at fees which are easily affordable to that sector.

Yours faithfully,

For and on behalf of the FWA operators per the attached Schedule

**The Schedule of subscribers to this Submission.**

| Name | Address | Contact telephone |
|---|---|---|
| Airwave Internet Ltd<br>t/a Airwave Internet | Lackabeha,<br>Carrigtwohill<br>Co. Cork<br>Ireland | 021 4882277 |
| Ajisko Ltd (t/a as)<br>Integrated Media Solutions | Unit 29<br>Innovation Works<br>National Technology Park<br>Castletroy<br>Limerick<br>Ireland | 061 310752 |
| Atlantek Computers Ltd<br>Ballina | The Square,<br>Belmullet,<br>Co. Mayo<br>Ireland | 096 70658 |
| Carnsore Broadband Ltd | Rosslare Harbour<br>Co. Wexford<br>Ireland | 053 910 1000 |
| DigitalForge, | Colla Road,<br>Schull,<br>West Cork.<br>Ieeland | 028 28983 |
| Interpoint Technologies Ltd | Technology House<br>Castleconnell<br>Limerick<br>Ireland | 061 3120.66 |
| Ker Broadband Limited<br>t/a KerNet Broadband | Flemby Bridge<br>Ballymacelligott<br>Tralee<br>Co. Kerry<br>Ireland | 066 7169681 |

| | | |
|---|---|---|
| Kerry Broadband Ltd | Ballygarron,<br>The Spa<br>Tralee,<br>Co. Kerry,<br>Ireland | 066 7136657 |
| Link Broadband Ltd | Unit F6<br>Riverview Business Park<br>Nangor Road<br>Dublin 12<br>Ireland | |
| Mr Paul Humphreys<br>t/a Maints Broadband. | Meanus,<br>Kilmallock<br>Co. Limerick<br>Ireland | 061 240690 |
| Ninetreehill Broadband Ltd | HG Donnelly & Son<br>Duke Street<br>Athy<br>Co. Kildare<br>Ireland | 087 6888088 |
| Rapid Broadband Ltd | Roscarberry<br>Co Cork<br>Ireland | 023 8869000 |
| Real Broadband Ltd | 4 James St,<br>Tralee,<br>Co. Kerry<br>Ireland | 066 7180298 |
| Skytel Networks Ireland Ltd,<br>t/a Skytel | M2 McConnell Business Hall,<br>Wexford Enterprise Centre,<br>Kerlogue Industrial Park,<br>Wexford<br>Ireland | 1 890 886 005 |
| Wireless Connect Ltd | Finnoe Road<br>Borrisokane<br>Co Tipperary<br>Ireland | 01 6205585 |

# The National Broadband Plan

## Response to

## Supplementary Information Request dated 27 March 2015

27 August 2015

FAO Ms Oonagh Brennan
National Broadband Plan – Supplementary Information Request
Communications Policy Division
Department of Communications Energy and Natural Resources
29-31 Adelaide Road
Dublin 2
Ireland

**E-mail: nbpmapping@dcenr.gov.ie**

Dear Sirs,

1. We refer to DCENR's request for supplementary information in relation to the NBP and to DCENR's recent request that fixed wireless broadband access providers ("FWAs") should not continue to be inhibited from providing information because of a lack of available licensed spectrum and should submit plans on the assumption that they have such spectrum. What follows is specific to those FWAs who write in these or similar terms and or who subscribe to the contents of this submission as per the schedule attached hereto, but the main themes would appear to apply to many if not all 80 or so FWA operators within the State. Please therefore treat this letter as a separate general submission made by each and every subscriber as named in the schedule to be accompanied by such other operator-specific submissions as each operator deems appropriate. Please also note that nothing stated in this submission is to be interpreted as comprising acceptance of or agreement with the contents of the DCENR 15 July 2015 Consultation Reports or the current Comreg 3.6Ghz Consultation, upon which separate submissions will be made in due course.

2. **<u>Unlicensed spectrum</u>**
   DCENR has made it clear both in its published documentation concerning the NBP and in meetings with FWA operators that those operating using unlicensed spectrum do not and will not qualify as NGA compatible. The reasoning for this exclusion has not been made explicitly clear nor reduced to writing explicitly, but in arriving at DCENR's specification for NGA compatibility DCENR has excluded all wireless media other than IMT LTE-Advanced, thereby excluding both unlicensed

spectrum and licensed spectrum technological solutions of all other kinds. DCENR has said unofficially that it has remained open to persuasion about alternative wireless solutions but to-date officially DCENR has not changed its stance. In its NPB publications DCENR has referred to reliability of service as a criterion and orally in meetings with FWA operators DCENR has said (i) that unlicensed spectrum is inherently unreliable and (ii) that because wireless solutions cannot reach 100% of all premises, wireless is NGA- incompatible for the purposes of the NBP. Through DCENR the State has also made it plain that it will not accept tenders from existing FWA networks intending to provide NGA services because DCNER does not consider them able to deliver a step change[7] - notwithstanding the fact that this directly contradicts the Eurpoean Commission's broadband State Aid Guidelines ("SAG").[8]

3. It is to be observed that the SAG requires technological neutrality and neither excludes wireless technology nor confines itself to any one iteration of that technology. To the contrary, in a recent State Aid clearance notification the Commission has found that recent technological and market developments made it possible for certain FWA networks to provide NGA capabilities in low density, rural areas and they can be competing alternatives to FTTC networks.[9] Accordingly, in arriving at the exclusion of all but one wireless solution (IMT-LTE Advanced) in the particular circumstances described below, the State would de facto appear to have failed to comply with the requirement of technological neutrality. In addition, the DCENR's setting of KPI's in the NBP, which in practice only fibre is likely to be able to meet, also appears to comprise a wireless technology exclusion mechanism in disguise, especially since such demanding metrics are not contained in the European Commission's technologically neutral SAG.

4. Be that as it may, all wireless solutions offering high speed broadband service require access to spectrum which is properly regulated, both as to this access being made available in timely and proper fashion from an investment and planning point of view, as well as in aggressive policing, monitoring and prevention of interference and other breaches of spectrum requirements. The State has been responsible for initiating and encouraging the development of wireless broadband principally in unlicensed spectrum in rural areas for many years. In 2004 the State launched the County and Group Broadband Schemes ("CGBS") to promote the rollout of broadband access to smaller rural communities of less than 1,500 people with the Government funding up to 55% of the infrastructure costs.[10]

[7] Paragraph 3.5.3.1 CFI April 2014

[8] Footnote 65 to the SAG gives the specific example of an upgrade of a basic to an NGA network as a qualifying step change.

[9] Paragraph 75 State aid SA.33671 (2012/N) – United Kingdom

[10] Over €1.4 million was invested in the first phase, providing broadband access to 38 communities with a combined population of over 36,000 people. The second phase of the scheme was launched in January 2005 with a further allocation of €6 million in grant aid. By November 2005 119 projects were approved for funding by the DCMNR and these were expected to cover a population of 355,000 people.

5. In its 12 February 2015 submission to DCENR regarding the National Broadband Plan mapping consultation, worldwide leader in FWA technology, Cambium Networks, stated that there is no technological reason why unlicensed spectrum could not be used to deliver a quality NGA service across much of the target map. Several FWA operators have already purchased and are testing Cambium equipment and, indeed, DCENR has attended a demonstration recently on 13 July 2015 in Clonmel, County Tipperary confirming NGA speed compatibility in both licensed and unlicensed spectra. Leaving aside the view of a specialist that has 4 million units deployed worldwide, it is submitted that problems of interference with unlicensed spectrum mentioned by DCENR are problems of failure of regulation by the State which are well capable of being resolved through a mixture of self-regulation and proper management. Arguments that the widespread use of unlicensed frequencies for domestic and business devices, such as internal wireless routers, microwave ovens etc., are trotted out as though conclusive of the unreliability of licensed spectrum, but the truth of those assertions is totally without empirical evidence by the State, whether through DCENR or ComReg its National Regulatory Authority ("NRA"). In practice, FWA operators using unlicensed spectrum supply service usually from elevated locations to CPE's also located at structural high points, so that when it occurs the real interference problem in the main rests with other operators. It goes without saying that the present threat of being driven out of business by the State would be more than sufficient incentive to the FWA sector agreeing to a contractual code of self-regulation and that this, coupled with agreement to sanction from the NRA for breaches, would go a very long way to reducing, if not almost completely eliminating this perceived mischief.

6. **Licensed spectrum**

As far as licensed spectrum is concerned, in or about 2003 the State, through its NRA issued licenses in the 3.5Ghz frequency for the purposes of point to multipoint service. The principal users (not to be confused with those to whom such licenses were issued but not required to be used – another regulatory failure) of those licenses have been and are FWA operators and indeed those licenses are referred to as FWALA licenses. In 2010 the State through its NRA gave notice that it would withdraw those licenses in 2017. From the point of view of business certainty, planning, deployment, employment, funding and investment the resulting uncertainty for all FWAs has been a serious setback. Only in July 2015 (*i.e.* last month) did the State's NRA issue a consultation document proposing to auction replacement spectrum in the 3.6Ghz frequency at some uncertain time in the future. The result is that leaving aside the damage the State has already caused to the FWA sector, no prudent sensible FWA business can make any plans with any certainty going forward. By no means therefore can this be said to be compliance by the State with paragraph 44 of the SAG.[11] The SAG, at paragraph 42, emphasises that the role of NRA's in designing a pro-competitive State aid measure in support of

[11] This states (in relevant part): *"Granting authorities shall also take into account spectrum (re-)allocations leading to possible network roll-out in the target areas that could achieve the objectives of the granting authorities without the provision of direct grants."*

broadband is particularly important, but quite the opposite is the case in Ireland.[12] However, the statement in paragraph 44 of the SAG pre-supposes that, unlike in this case with the NRA, the relevant national authority has already been complying with its obligations to do all in its power to allocate spectrum in such a way as to achieve the intended State aid objectives without recourse to State aid.

7. **Information requested**
As far as the State's NBP as at present proposed is concerned, the Intervention Area ("IA") is being articulated as a function of those areas where NGA (as defined by the State in its NBP proposals) is not or will not be made available to end users originally within 3 years from 2013 but now (in 2015) within 5 years from 2015. In order for an FWA operator to avoid its coverage area(s) being included in the IA, an FWA operator must submit technical, financial and deployment plans to the satisfaction of DCENR showing it is or will provide NGA services.

8. In relation to financial plans the State requires, inter alia, under the heading of "Funding plan", details of each source of funding for investment in the NGA infrastructure and services to 2020, together with details of agreements with funders and, if from equity, the identity of investors and confirmation, if from debt, loan conditions and confirmation re the same.

9. **Impossibility of compliance**
From the above it can be seen that by definition an FWA must submit plans based on the availability of licensed wireless spectrum. However, it can also be seen that there is complete uncertainty as to availability and price of the only appropriate licensed spectrum which might become available at an as of yet indeterminate time and process. Aside from not being required by the SAG (see below), it is therefore totally unrealistic for the State to demand detailed specific concrete financial plans including lender confirmations in respect of investments which, by virtue of the State's definition of NGA for the purposes of the NBP and the State's management of spectrum, not only at present unavailable, but are also uncertain and un-priceable other than in the most speculative manner.

10. An even greater contradiction and impossibility, once again created by the State, is DCENR's determination that wireless is unsuitable for NGA because of DCENR's unverified and unempirical conclusion that wireless cannot reach 100% of all premises. In 2008 the State selected and paid the mobile operator *Three* some €78.9 million of State funding under the State's previous and only true pan-State aided attempt to provide basic broadband to rural end-users. As a large market operator in whom the State placed such confidence, *Three*'s submission to DCENR's 24 November 2014 Consultation should not therefore be ignored lightly when it stated: *"in cases of long loop,* [wireless] *would provide a superior end-user*

[12] By e-mail dated 10 April 2015 Gerry Fahy on behalf of ComReg stated the following: "*I would also remind you that* ***ComReg has no decision-making role*** *in regard to the design of the National Broadband Plan (NBP) or the award of any contracts under the NBP"*[Emphasis added]

*performance to FTTC."* [13] Leaving aside the fact 100% coverage is not a requirement of the SAG,[14] and thus appears to comprise unfair discrimination by the State against FWAs, it would be imprudent and misleading both to investors, shareholders and lenders for FWAs to avoid revealing the risk, inherent in any such investment, *i.e.* that the State will intervene as it is now proposing and that it will do so not just with NGA speeds but with ultra-fast fibre optic cable direct to every home and business. It is difficult to understand why the State demands these details[15] of FWA operators in circumstances where the State knows full well that no investor or business in their right senses will invest in an NGA service scheme when, according to the State's publicity campaign, the State will be subventing far higher speeds to be provided at subsidized prices to all end-users in an FWA operator's area.

11. **Discriminative process**

It is to be noted that in pursuing the current NBP the State has adopted a "one size fits all" approach and that approach has been targeted on the basis that all stakeholders are large operators with adequate resources readily available to meet the State's informational demands and timelines. In this regard it is worth stating that the majority of the 80+ operators in the FWA sector are indigenous Irish-owned SMEs, precisely the kind of rural businesses the State declares it wishes to foster and promote.[16] As such the demands placed upon their resources by the State throughout the NBP process commencing with the November 2013 mapping requirements (e.g. details of all infrastructure in deployment, antenna heights and types, BER, ESRI Shapefile, ESRI Geodatabase) and continuing through to the rigorous technical, financial and deployment data demanded to avoid being included as an IA – have quite simply been so overwhelming as to ensure much of the sector's inability to participate either meaningfully or at all. In meetings with FWA operators the State's DCENR has expressed the view that if FWA market stakeholders cannot meet these informational demands and requirements the market is better off without them – this notwithstanding the fact that paragraph 65 of the SAG does not compel the State to act in this way – it merely confers a discretion to require detailed information in order to inhibit stalling expressions of interest by large operators.

12. In short, this too appears to be discrimination in that the State is using the greater market power and resources of large operators as a means of crowding out smaller less powerful operators from participation in the NPB process and thus putting their businesses at risk. Whilst footnote 94 of the SAG entitles Member States like the State not to be concerned where an existing operator does not provide any

[13] Page 23, 24 November 2014 DCENR Consultation re High Speed Broadband Map 2016.
[14] cf footnote 80 thereof.
[15] Cf this approach with the State's refusal to publish its Cost Benefit Analysis, Financial Appraisal and Cost Modelling Reports.
[16] The Taoiseach: Small businesses are *"the backbone of economy"* see http://www.irishexaminer.com/ireland/taoiseach-small-businesses-the-backbone-of-economy-336743.html

meaningful data, that footnote cannot be safely relied upon in circumstances where the State has constructed the data-collection process in a manner prohibitive to smaller market operators. The fact that between the commencement of the NPB in 2012 and the present the State has not made any allowance for the resource profiles of stakeholders nor for the possibility that their time and resources may be those of SMEs, not large players, is proof positive in itself.

13. **Willingness to invest in and provide NGA services by 2020**

For the avoidance of any doubt on the State's part, we place on record the fact that those FWA operators subscribing to this letter (and probably most if not all others in the sector, for reasons that are self-explanatory) wish not just to continue in business but also to be permitted to provide NGA services, ideally using unlicensed spectrum by at least 2020. To be clear, by 2020 we do intend to invest in our infrastructure to provide NGA speeds (being 30 Mbps download and 6 Mbps upload) as defined in the SAG. If however the State continues to refuse to accept unlicensed spectrum as NGA compatible, then without prejudice to whether such a refusal would be compatible that meets the SAG (which we believe it would not), we would intend to upgrade our networks by 2020 using licensed spectrum which is both available without uncertainty and which is affordable by reference to the FWA sector's position in the market. It goes without saying that we can only do this if we do not have to compete with FTTH subvented by the State, because it would be all nigh inevitable that our NGA services would be competitively annihilated by the State's subventing the provision of FTTH super-fast services.

14. **Forfás visited**

The key for all operators in the FWA sector has always been and remains easily accessible and competitively priced affordable backhaul infrastructure. In its report *"Benchmarking Ireland's Broadband Performance"* dated November 2005, Forfás[17] wrote as follows:

> "The MANs programme, as well as the County and Group Broadband Schemes, have provided some infrastructure competition but **limited co-ordination of these and other State-owned infrastructure is curtailing their effectiveness**. The provision of competitive backhaul and national backbone capacity to connect the MANs to main national and international nodes and to each other **is crucial to the take-up of the facilities by service providers**. **Without this backhaul capacity, the local access networks are isolated and have limited appeal to potential service providers**. 18 of the 20 MANs currently managed by e-net have a backhaul connection from either ESB Telecom or BT Ireland. Service providers wishing to deliver services over a MAN are then in a position to avail of a complete end-to-end service, guaranteed with joint Service Level Agreements (SLAs) from e-net and the relevant backhaul carrier. **The availability of competitive backhaul links to the MANs remains a concern for locations not served by either the ESB Telecom or BT Ireland backbone networks**, such as two of the recently completed MANs, Kiltimagh and Gweedore. This problem is likely to increase as future phases of the MANs programme are rolled out. **External connectivity is also crucial for the viability of the County and Group Broadband Schemes**. The

[17] Forfás, which was established in January 1994 under the Industrial Development Act 1993, was the national policy advisory board for enterprise, trade, science, technology and innovation in Ireland and run by a board appointed by the Minister for Jobs, Enterprise and Innovation, to whom the agency was responsible. It was dissolved on 1 August 2014 when Forfas' policy functions were integrated with the Department of Jobs, Enterprise and Innovation.

feasibility of using other state owned assets such as Aurora and RTE to provide a complete end to end service nationally needs to be explored to ensure that the state investment in the MANs and other infrastructure is fully exploited" (pages 14 - 15) [Emphasis added]

15. Forfás' identification of the State's failure to address its limited co-ordination of the FWA sector's Group Broadband Schemes and to address the crucial issue of their isolation from competitively priced and available backhaul negates if not completely undercuts, the State's argument that the coverage areas served by the FWA sector is as a result of any market failure on FWA operators' part. The truth of the matter is, as identified by the State's own national policy advisory board, namely that this lack of backhaul has arisen as a result of a failure of management, incentivisation and deployment of resources by the State and its organs since 2005.

16. **Relative uniqueness of Irish FWA sector compared to other EU countries**
Ireland appears to be unique among other EU countries in having a far higher percentage delivery of FWA operators (licensed and unlicensed) in rural areas than other EU countries. This is a result of the low population density and particularly the dispersed settlement pattern. This basis of ascribing such uniqueness is founded upon discussions held between the Internet Service Providers Association of Ireland ("ISPAI") and EuroISPA, but because not all EU countries are represented in EuroISPA there is a caveat. Although Ireland's NRA's (ComReg's) data concerning the FWA sector is and has always been deficient, because ComRreg has not bothered to collect such data comprehensively, it is understood that the FWA sector in Ireland now serves in excess of 100,000 homes and over 8,000 businesses in rural areas. Subject to the abovementioned caveat therefore, the fact that the FWA sector in Ireland occupies a far more important role than in other EU countries might not be immediately apparent to the European Commission nor generally for the purposes of compliance with State Aid requirements. This is a matter that we wish to bring to the European Commission's attention.

17. **Forfás re-visited**
In its January 2010 report,[18] Forfás again noted the importance of wireless spectrum to play a strong role in the delivery of higher-speed broadband, that it was crucial to FWA networks,[19] that "*Wireless technologies may be a particularly good alternative to fixed line wired broadband in rural areas where subscriber densities are lower and the economics of investment in fibre to the home/premises is less attractive"* and as in its 2005 report, that *"... wireless technologies require fibre infrastructure to be extended out to radio base stations which serve consumers."*[20]
In other words, as observed by the State's own policy advisory board, both in 2005 and again in 2010, the reason for the lack of rollout to-date of NGA services in the rural areas that are now being served by the FWA sector is not attributable to "market failure" (as the State asserts), *i.e.* due to the operators' fault or their unwillingness to invest, but instead it is due to the State's persistent and continuing

[18] "Ireland's Broadband Performance and Policy Actions"
[19] Ibid, page 6.
[20] Ibid, page 36.

failure to make available easily accessible and affordable backhaul infrastructure to rural areas in which it had previously encouraged the FWA sector to get itself established.[21]

18. **Why have these points not been made earlier in the NBP process?**
To address any potential criticism about the critically important issues that are raised here not having been made any earlier, a couple of points arise. The first is that from 2012 to Q3 2014 the NBP appeared to be concerned solely with providing high speed backhaul only. Presented that way, subject to concerns about exclusion from NGA compatibility and access to licensed spectrum, the FWA sector saw a real opportunity, at last, for accessible affordable competitively priced backhaul, *i.e.* that the NBP might be able to present their businesses with the opportunity to thrive and compete to provide competitive NGA services on a level-playing field. However, only in Q3 of 2014 did it become apparent that the focus of the NBP had in reality become FTTH, which, of course, heralds a steamrollering of the FWA sector out of business. The other point to be made is that individual FWA operators have made submissions, both written and oral, which, to varying degrees, have included different aspects of the points raised in this submission so that the State, through DCENR and ComReg has been well aware of these concerns and of the effect its NBP will have if pursued as is now proposed.

19. **Willingness to provide coverage area data**
For reasons already explained, the detailed information and concrete plans demanded by DCENR so as to avoid inclusion in the IA cannot be supplied at this stage. However, to the extent that any of them have not already done so, the subscribers to this letter stand ready and willing to provide information about their coverage areas to DCENR in a manner consistent with their available time and resources so that the State can be fully informed as to the resource constituted by FWA operators in meeting the State's NGA objectives in a speedy, efficient and economic manner. What we can not do, however, is be drawn into a costly time and resource demanding process with DCENR if its real purpose is to ensure that an NBP as now focused on FTTH would qualify for State aid approval from the European Commission

20. **Proof of willingness to invest, stalling and the SAG**
As to proof of willingness and ability to upgrade our networks to deliver NGA speeds by 2020, a couple of points arise here too. First, it is noted that the SAG[22] does not in fact require that the State demand concrete proofs of the type now being demanded by the State. That facility was created so as to enable the State to take

[21] MANs manager ENET has recently quoted an FWA operator €14,500 for a 299km 100Mbit backhaul connection from Tralee to Dublin. Providing end-users with a 30Mbps NGA service would therefore cost €240 per customer per annum excluding VAT solely for backhaul. This is an illustration of why the FWA sector cannot propagate to the end-user until the wholesale model is corrected, not market failure at customer access level

[22] Paragraph 65

action against the risk of operators stalling public intervention merely by making expressions of interest. In short, the State has a discretion about making such demands and with regard to their onerousness depending on how strongly it assesses that risk in each particular case. By insisting on a mandatory uniform set of data requirements targeted at the level of resources only available to large market players, the State has abrogated its obligation to consider the risk in each case and to ensure the information requirements (and their costs of production) are proportionate to the resources of SMEs and small players in the market. In short, whether by accident or design, the State's process has the effect of shutting out small operators like those in the FWA sector, and, indeed given the absence of any other category of small player, appears to be deliberately targeted at them.

21. The other point to be made in this connection is self-evident. We already operate in these areas. With the State's encouragement since 2003 we have established and developed our businesses in these areas successfully. In its NBP documentation and elsewhere the State itself proclaims its success in the rollout of basic broadband across the entire country through its broadband schemes. The State therefore has little or no basis for concluding, without any investigation whatsoever that FWA operators' declarations of willingness and intent to invest in upgrading their networks to NGA compatibility by 2020 are empty expressions intended for stalling purposes. If affordable easily accessible competitive infrastructure were made available to us on an open-access transparent and level-playing field basis, we would have no choice but to upgrade our networks to NGA standards to match the usual competitive market pressures that will arise as a result.

Since this letter concerns key issues related to the SAG and to a successful application for State Aid we are sending a copy of the same to the European Commission in order that it is fully informed of the position of FWAs and of their specific importance in providing broadband coverage in rural Ireland.

Yours faithfully,

# 11 KerNet Broadband

Ker Broadband Communications Ltd
T/A KerNet Broadband
Flemby Bridge, Ballymacelligott, Tralee, Co. Kerry
**Tel:** 066-7169681 **Mob:** 087-9683073 **Web:** www.kernet.ie **Email:** info@kernet.ie

27 Aug 2015

Mr. Joseph Coughlan

Commission for Communications Regulation

Irish Life Centre

Abbey Street

Dublin 1

Submission on Comreg 15/70 from KerNet Broadband.

KerNet Broadband is a small, locally based ISP serving the geographical area of the eastern part of County Kerry and crossing into the North Cork and South West Limerick. It is in existence with the last ten years and our customer base is mainly in rural based communities.

In consideration of this, we wish to point out in this submission to ComReg that the Consultation should make serious allowance for;

1) The sparsely populated areas and mountainous terrain that KerNet covers.
2) That KerNet Broadband has no experience of previous license auction processes and the technicalities of the course it would take.

Section 3: Draft Regulatory Impact Assessment (RIA)

Reasons why KerNet propose that a portion of the spectrum in rural areas should be designated as primarily for FWA where operators have expressed an interest in rollout of NGA equipment.

1) The relatively large amount of available spectrum.

Ker Broadband Communications Ltd
T/A KerNet Broadband
Flemby Bridge, Ballymacelligott, Tralee, Co. Kerry
**Tel:** 066-7169681 **Mob:** 087-9683073 **Web:** www.kernet.ie **Email:** info@kernet.ie

2) The national interest to deliver NGA broadband to as many rural premises as possible in the shortest timeframe and the lowest impact to the taxpayer.

3) The history of service provision by FWA providers. We contend that had it not been for ComReg decision 10/29 or had ComReg provided a much earlier consultation on the 3.6Ghz spectrum then there would have been significantly greater investment in licensed FWA with significantly more competition and subscribers connected in rural areas. As it is, more that 60% of the known 74,000 FWA subscribers in Ireland are connected using license exempt equipment, largely for this reason. By ensuring adequate spectrum is made available (at a reasonable price) in large areas ComReg can encourage investment in the sector which may significantly reduce the dependence on state subsidy in the NBP.

4) Typically the amount of spectrum required to deliver competitive mobile services is significantly less that the spectrum required to deliver competitive fixed services as the expectation of the consumer is that the mobile service will involve a (relatively low) usage cap typically less than 20GB, whereas the expectation for fixed service is that there is no cap - or a relatively high one (200GB). In addition there is a stated intension to release other spectrum bands in the near future (2.3 and 2.6GHz) that are better suited to Mobile services and therefore likely to be economically out of reach for FWA providers.

In the opinion of KerNet, it is inappropriate to award a significant amount of spectrum via an auction process to authorized operators for use solely as capacity spectrum in hotspots in the larger towns within the rural regions. These towns will soon be well served by fixed line services from Eircom and SIRO. Due consideration must be given to the national interest in delivering NGA access to as many rural locations as possible with the least impact to the taxpayer. Requirements for in-building capacity spectrum by MNOs could and should be met through an obligatory system of sub-leasing of spectrum for these purposes. We extend this point to highlight that it should not be permitted to acquire spectrum on the basis of the potential for future use and that any award should be based on presentation of clear evidence of concrete rollout plans. In meeting its statutory obligations, Comreg must ensure that these plans are real and substantiated.

Section 4: Key aspects of the Proposed Award Spectrum.

The band plan will be TDD, 1x 25MHz slot and 65x 5MHz slots.

Regions will be established in line with the principles established by ComReg. (Option. 2)

License duration of 15 years should apply to the 3.6GHz band.

Ker Broadband Communications Ltd
T/A KerNet Broadband
Flemby Bridge, Ballymacelligott, Tralee, Co. Kerry
**Tel:** 066-7169681 **Mob:** 087-9683073 **Web:** www.kernet.ie **Email:** info@kernet.ie

KerNet support the option 2 boundaries. But, we believe that it is imperative that an efficient process for spectrum trading be created alongside this process. There are many well established smaller/medium size WISP's, who are interested in using 3.6ghz to deliver NGA services, especially in rural areas. In practical terms, spectrum trading is the only way in which this can happen. The pricing model for such trading needs to be clearly set out and transparent.

KerNet believe that the license duration should be 20 years, to bring it into line with the proposed NBP award and to give greater investment certainty to operators.

Section 5: Award Type and Format

A cap of 150-250 MHz per operator should apply

The minimum price should be apportioned on a 50/50 basis (SAF and SUF).

Minimum price range of between €0.015 and €0.025 per MHZ per capita.

KerNet support the following ComReg proposals:

1. That the 3.6 GHz band is assigned with no other bands included in the process.

2. That the region model (option 2) proposed by ComReg is appropriate.

3. That a cap should apply. We recommend a cap of 100Mhz in an initial phase (perhaps 2 years) with opportunities to acquire additional spectrum provided defined criteria (to be developed) are met. We propose that these should include at least the number of subscribers connected in a given license region.

5. That rollout obligations should apply to successful bidders and failure to comply within specified timeframes should result in loss of access rights to spectrum.

Ker Broadband Communications Ltd
T/A KerNet Broadband
Flemby Bridge, Ballymacelligott, Tralee, Co. Kerry
**Tel:** 066-7169681 **Mob:** 087-9683073 **Web:** www.kernet.ie **Email:** info@kernet.ie

Minimum Pricing.

The economies involved in fixed wireless networks are significantly different from those of MNOs as is clearly understood by ComReg. ComReg appear to acknowledge this in the proposed pricing model where a minimum price of €0.015 is proposed for rural regions vs. €0.025 for urban. However this does not go far enough. Given the national interest, it would seem appropriate that a much reduced SAF should apply to operators who indicate an intension to deliver NGA services in rural areas. ComReg can easily ensure the legitimacy of such operators by specifying rollout obligations.

Setting the minimum price of a region based on an assumption of full coverage of the population within that region is false. The population covered is more accurately determined by an analysis of coverage from known mast sites.

In deriving the minimum price, the population numbers that may be potential customers for FWA in rural areas should exclude the population of larger towns where there is access to fibre or cable technologies or where access to fibre is planned to be available in the near term. Indeed given the recent announcement by Eircom and the proposals of the NBP the subscriber base that may be connected by NGA FWA is likely to reduce significantly between now and 2020. All of this would greatly reduce the population number used to determine the minimum price point.

Finally, we contend that rather than a 50/50 split of the SAF vs. SUF that a 25/75 split would encourage more participation by existing smaller companies and new entrants. The price at which 3.6 GHz licences will be acquired at, will greatly affect the price at which NGA services can be delivered at. To ensure competitively priced and affordable FWA services, and to promote competition (a comreg statutory obligation) especially in rural areas, it is imperative that SAF & SUF payments are kept to a minimum.

Section 6: License Conditions

Subject to interference conditions being met, there should be an obligation on license holders to provide spectrum to other smaller operators in areas where they do not plan to provide coverage within specified time limits. The pricing model for such sub-leasing should be determined in advance of the spectrum award process but we propose that the pricing should be based on a similar population model as ComReg propose and should discourage opportunism.

Ker Broadband Communications Ltd
T/A KerNet Broadband
Flemby Bridge, Ballymacelligott, Tralee, Co. Kerry
**Tel:** 066-7169681 **Mob:** 087-9683073 **Web:** www.kernet.ie **Email:** info@kernet.ie

The obligation to sub-lease spectrum should also apply in situations where a transmitter in one region may be used by another operator to serve a population in an adjacent region. Provided that the requesting operator can demonstrate to ComReg's satisfaction that their frequency plan does not impact on the requested operator then there should be an obligation to sub-lease the requested spectrum.

Conclusion

KerNet Broadband wish to re-iterate our opening remarks in relation to our opinion that ComReg should make serious allowance for an ISP operating in the rural area and inexperience in licence action processes.

Please note that this submission is of non-confidential status.

Yours Sincerely,

Daniel Kerin

Network Development

# 12 Munster Wireless Ltd

Munster Wireless Ltd. The Mill, 1 Bridge St., Cahir, Co. Tipperary, Ireland. www.munsterwireless.com - info@munsterwireless.com - +353 527442814

28th Aug 2015

Commission for Communications Regulation,
Block DEF,
Abbey Court,
Irish Life Centre,
Lower Abbey Street,
Dublin 1,
D01 W2H4

**Consultation on Proposed 3.6GHz Band Spectrum Award**

The following are the views of Munster Wireless Ltd. on the proposed 3.6GHz band spectrum award:

- Auctioning spectrum to highest bidder is cost prohibitive to smaller providers.
- The cost of spectrum must be passed to the end user.
- The coverage area of licenses is too large for small providers.
- Subletting of spectrum will be cost prohibitive to small providers.
- While setting the minimum price high to encourage the use of spectrum may be effective for the large providers it will put it out of reach for the smaller ones.
- Making a third of the available spectrum available to existing fixed wireless providers at a minimal price and in smaller coverage areas will benefit the consumer and promote competition while allowing the state to maximize returns on the remaining spectrum.

Yours sincerely,

Pat Fitzgerald
Munster Wireless Ltd.

# 13 Net1 Ltd

Net1.ie
Delivering Broadband Internet

Mr. Joseph Coughlan
Commission for Communications Regulation
Irish Life Centre
Abbey Street
Freepost
Dublin 1
Ireland

28'th August 2015
Consultation on Proposed 3.6 GHz Band Spectrum Award 15/70

Dear Sirs,
We submit our comments as follows
4.5 Chapter 4 Consultation Question
Net1 Ltd Response

- Net1 agrees that regions should be established in line with the principles identified by ComReg in order to allow a single operator or group of operators to achieve a significant critical financial & administrative mass to allow them to join the competition in order to submit a viable bid/proposal for spectrum thereby delivering increased competition for services in rural areas.
- Net1 agrees the Option 2 should be used.
- Net1 agrees that • a licence duration of 15 years should apply to the 3.6GHz band in order to make it economically viable for an operator to achieve a return on investment and provide enough time for finances to be raised to upgrade of equipment to second or third generation of FWA for enhanced services to customers

5.10 Chapter 5 Consultation Question 5.146
Do you agree with ComReg's preliminary views set out in Chapter 5 and, in particular, that:
Net1 disagrees that a • a combinatorial clock auction is the preferred auction format; should be used, because achieving the highest price for the permit to use the section of spectrum will not serve the best interests of the rural sparsely populated community. Whereas a beauty contest between bidders for permit to use blocks of spectrum for a fixed price will produce the winners who undertake to deliver the best services at increased competition in the market in areas which have been deemed by DCENR consultants as having a "Failed Market". Clawback & penalties could be included in the process in order to ensure bidders undertakings in these poorly served rural areas are actually delivered . Whereas the combinatorial clock auction suggested above will deliver an expensive license for which the operator must claw back the bidding cost from the customers which is not a suitable method to deliver market competition in areas where there is currently a "Failed Market". Net1 Ltd feels that Comreg has underestimated the numbers of existing customers currently using FWA services currently being delivered via 3.6Ghz spectrum, and also has underestimated the significantly larger number of FWA customers currently receiving their Broadband Services in the ISM band FWA (which we belive is over 160,000 customers in the recent census taken by ISPAI Wireless Working Group and the population is rapidly increasing due to demand ) who need to be moved to a more reliable licensed platform

6.8 Chapter 6 Consultation Question 6.142
Do you agree with ComReg's preliminary views set out in Chapter 6 and, in particular, that:

- Net1 Ltd agree that the band should be released on a service- and technology-neutral basis in order to provide for the possibility of technology upgrades during the life of the license period to deliver improved services for customers.; •
- Net1 Ltd agree rights of use in the band should be awarded on a non-exclusive basis; •
- Net1 Ltd agree that there should be an obligation to notify of the termination of a technology should apply in order to protect the best interests of the customer for the duration of the license.
- Net1 agree that a rollout obligation should apply for spectrum rights of use in this band and that such an obligation should be based on a minimum number of base stations to be deployed per sub-national region in the best interests of actually delivering in a short time after license award the Next Generation Superfast Fixed Wireless broadband Services for customers
- Net1 agree that a quality of service obligation should apply in relation to each of network availability and voice call standards in the best interests of delivering Customers satisfaction throughout the life of the license permit.
- Net1 Ltd agree that at regional borders a coordination threshold should apply to allow for bilateral/multilateral co-existence agreements; and • where agreement in cross-border coordination fails to be met, the coordination threshold limit should be set as a binding licence condition. In the best interests of delivering a reliable customer service.

Yours faithfully

Andrew mckeever

# 14 Premier Broadband Ltd

PREMIER Broadband

Unit 57
Westside Business Park
Old Kilmeaden Road
Waterford

t: 1890 815 660
e: info@premierbroadband.net
w:www.premierbroadband.net

Thursday, 27 August 2015

Commission for Communications Regulation,
Block DEF,
Abbey Court,
Irish Life Centre,
Lower Abbey Street,
Dublin 1,
D01 W2H4

**RE: Consultation on proposed 3.6 GHz band award**

Premier Data Networks LTD (Trading as Premier Broadband and Alphawave Communications), established in 2005 was setup under the Government's National Broadband Scheme to provide rural broadband services. We provide services in Counties Waterford, Wexford, Kilkenny, Carlow, Cork and Tipperary and serve business and residential users ranging from schools to large businesses. Premier is a member of the ISPAI and is an active member of the ISPAI Wireless Sub Group.

**Spectrum delegation towards FWA and NBP**

We agree with Comreg's proposal that the 3.6ghz band be auctioned separately to the grouping of other bands such as 700mhz, 1.4ghz and 2.3ghz. We also propose the following.

- *A larger proportion of the spectrum be used for the delivery of FWA:*

There is currently a requirement for licensed spectrum by WISPS in Ireland, as demonstrated by the fact that a large proportion of the current FWA subscriber base is supported by non-licensed technology. 3.6ghz is not ideal for delivery of mobile services, as seen by the lack of band enabled mobile devices (GSA Report April 2015) and limitations on services such as download caps. Comreg also proposes to release additional spectrum which is ideal for mobile services.

- *A report undertaking the impact of the 3.6ghz band on the national broadband plan currently proposed by the DCENR:*

It is our view that a cross department report such as this could identify savings ,reduce the dependence on state subsidy for the NBP and alleviate the burden on the taxpayer.

- Spectrum should not be allocated to operators on a "future plans" basis and operators must show short term plans to utilise the spectrum to its capacity.

PREMIER Broadband

Unit 57
Westside Business Park
Old Kilmeaden Road
Waterford

t: 1890 815 660
e: info@premierbroadband.net
w:www.premierbroadband.net

**Regions**

We broadly agree with the plans by Comreg to divide the spectrum allocation into regions.

**Licence Duration and Type**

We agree that the license duration should be approximately 15 years and be primarily used for LTE-TDD. Furthermore, a review of the assigned spectrum should be undertaken every 5 years to ensure efficient use and the delivery of services to end users. Upon expiration of the license a consultation should be undertaken with the stakeholders at least 5 years before the next award of the spectrum. This would enable stakeholders to undertake future directions and preparations for any technology upgrades or business changes.

**Spectrum Allocation Limits and Withdrawal of Spectrum**

It is quite difficult for WISPs who wish to invest in licenced communications infrastructure and grow their customer base due to a number of problems with the previous spectrum award. We would propose that Comreg limit the amount of spectrum given to any individual operator to 100mhz for the following reasons.

- Spectrum Hoarding
- Under Utilisation by operators
- *Demonstration of Rollout*: An initial phase of 18 – 24 months should be considered to allow an operator to meet a defined set of milestones which will allow additional release of spectrum. This will ensure the spectrum is utilised and the operator is performing in a defined area.

It is our view that operators that clearly demonstrate that they are failing to deliver services to the market, in terms of the number of base stations (leased or owned) and the number of customers, should lose access rights to the allocated spectrum.

**Minimum Pricing**

We would not agree to the minimum price structure as proposed by Dotecon document (15/72 ) and believe the cost should be significantly less due to the following reasons.

PREMIER Broadband

Unit 57
Westside Business Park
Old Kilmeaden Road
Waterford

t: 1890 815 660
e: info@premierbroadband.net
w:www.premierbroadband.net

- The average pricing model by countries that previously auctioned off the spectrum was based on a significantly reduced availably of NGA access. Since these auctions have taken place, access technologies such as fibre and cable have increased significantly, reducing the market size for licensed spectrum services.

- The pricing does not take into consideration the NBP. Setting the minimum pricing too high would prevent smaller operators from participating in the auction process.

- The pricing structure is based on the upper end of the scale. Additionally, basing the cost on an assumption of population coverage is a problematic model to follow. 3.6ghz cannot, and never will, provide 100% population coverage due to its poor propagation characteristics. Comreg should estimate a more realistic population coverage by excluding areas that have access to NGA technologies such as fibre or cable modem access. Furthermore, the market size will be reduced even further by inclusion of the recent announcements by Eircom, SIRO and the DCNR.

- We refer to our previous suggestion that the spectrum could indeed provide a social dividend to the population, significantly reducing the cost of the NBP and the burden on the taxpayer if priced correctly. One solution is to introduce a low cost 100mhz section of the spectrum that would allow unlicensed operators to compete and migrate to NGA/LTE based products.

**License Conditions**

We believe that the conditions of the license are the most important aspect of the ward prices. The winners of the spectrum must meet the conditions in relation to interference, deployment of base stations and utilisation. Holders should be obliged, as part of the contract, to sublease the spectrum to smaller operators if they do not have concreate plans to roll out NGA services in an area. The cost and mark-up of spectrum should also be defined by Comreg /regulator as part of the award process and should not be prohibitive in allowing smaller operators gain access to the spectrum.

Yours Sincerely,

Niall Clancy
Premier Data Networks LTD.

# 15 Rapid Broadband Ltd

Response to Consultation 15/70
on
Commission for Communications Regulation
10 July 2015
Consultation on Proposed 3.6 Ghz Band Spectrum Award

28 August 2015

Mr. Joseph Coughlan
Commission for Communications Regulation
Irish Life Centre
Abbey Street
Freepost
Dublin 1
Ireland
Email: marketframeworkconsult@comreg.ie

Dear Sir,
Please find attached Rapid Broadband Ltd. submission in relation to the 15/70 consultation. In summary, Rapid Broadband feels that the 3.6 GHz Band award process should be dealt with separately from other frequencies. Rapid Broadband feels that Fixed Wireless operators have provided an important service to rural and small urban communities across Ireland for many years and that the 3.6 GHz band is the best opportunity that we and other operators have to continue to provide this local and important service. Rapid Broadband has extensive local knowledge as well as the short range infrastructure and sites that will allow us to provide high speed broadband as part of the National Broadband Plan, but it is critical that the 3.6 GHz spectrum be available.

Care must be taken to ensure that the spectrum is not awarded to large operators for use purely for capacity planning or for anticompetitive reasons. If large ranges of spectrum are awarded to MNO's then it is incumbent on Comreg to ensure that the frequencies are used and that a system for sub-leasing the frequencies at commercially viable rates is mandated.

| Ref | Topic | Comment |
|---|---|---|
| 2.17 | Background | We strongly agree with the majority opinion that the 3.6 Ghz band awarded as part of a separate award process. This will allow smaller operators to compete on a regional basis with SNO |
| 2.26 | FWALA | Looking at the overall numbers of FWA customers in Ireland gives the impression that numbers are dropping steadily over time. That however does not properly show how the numbers are steady or increasing in rural areas. A map showing the areas serviced by each FWA and their % growth or decline would be more accurate as it would remove the very significant drop in urban wireless users over the last 5 years. |
| 3.82 | Auctions | A pure financial auction is not the best approach to dealing with the assignment of frequencies that will be used to deliver short range services. A more considered approach that takes into account ability to implement, existing infrastructure and likelihood of utilisation should be used. |
| 3.87 | | Rapid Broadband feels that option 2 is more suitable |

| | | |
|---|---|---|
| 3.91 | | Rapid Broadband agrees with the sentiment that some of the band should be reserved for TDD based provision of broadband in rural and small urban areas. |
| 3.130 | | If indeed Comreg goes ahead with option 1 and the award of the spectrum through an auction process, it must ensure that existing and new FWA operators can bid on the frequencies for their areas of commercial interest |
| 4.64 | Regional Licences | Rapid Broadband agrees that licences should be awarded for particular regional areas |
| 4.94 | | Rapid broadband feels that the very limited number of regions suggested will be unworkable. Including all of Munster into one region (except for Cork and Limerick cities) guarantees that no FWA will be in a position to bid. How would Comreg deal with multiple WISP bidding together for a region? Would this be considered anticompetitive ? |
| 4.147 | Questions | Rapid Broadband largely agrees with these points with a caveat around how regional licences will be sublicensed to smaller operators. |
| 5.120 | Pricing | Care should be taken when looking at the minimum price for the spectrum to consider the low population density of many of the regions. Care should also be taken to exclude from the population numbers, the populations of the larger towns that have or will have access to fibre based broadband |
| | | |

Regards

Micheal Twomey,
Rapid Broadband Ltd.,
Rosscarbery,
Co. Cork

# 16 Real Broadband Ltd

REAL BROADBAND Ltd.

4 James St, Tralee, Co. Kerry. Tel 066 7180298

August 28th, 2015

Mr Joseph Coughlan
Commission for Communication Regulation
Irish Life Centre
Abbey Street
Dublin 1

Dear Sir

Please accept the information below for inclusion in your consultation 15-70

There is a lot of interest in the spectrum being offered from smaller regional providers for whom their service area is more in keeping with their region rather than the province that they are from. It is our view that the proposed licensing scheme is heavily weighed towards a few large providers acquiring spectrum nationwide or per province.
I would propose that Comreg change the proposed licensing scheme to facilitate the smaller operators either by allocating some of the spectrum on a more localised basis to accommodate all the interests.

Additionally the auction process requires a Masters Degree or above to understand how this works, most likely bidders are likely to be bidding against themselves because of a lack of understanding in the bidding process/method.

As one of the previous FWALA licence holders the limited duration of the licence with no obvious continuation path being available was of concern, we would propose that 5 years before the end of a licensing scheme that its replacement is decided on.

We like to see licence duration of 20 years, with provision that spectrum hoarding is not possible.

In the licence conditions we would like an obligation on large providers to sub-licence unused spectrum in an area at an affordable rate in keeping with costs.

Yours sincerely

Edmond Diggin
Director

# 17 Ripplecom

August 27th, 2015

Mr Joseph Coughlan
Commission for Communications Regulation
Irish Life Centre
Abbey Street
Freepost
Dublin 1
Ireland

ripplecom
connecting business

Portal House
Raheen Business Park
Raheen
Co. Limerick

Tel: 061 500 250
Fax: 061 307 788
Email: info@ripplecom.net

**Re Submissions to ComReg 15/70**

Email: marketframeworkconsult@comreg.ie

Dear Mr Coughlan,

## 1 Introduction

I refer to your Call for Input entitled 'Consultation on Proposed 3.6 GHz Band Spectrum Award'.

At the outset, Ripplecom welcomes the publication of this document and the overall direction of the document is in line with Ripplecom's view that the 3.6 GHz band should be separated out from the other spectrum bands. In the 14/101 submission, Ripplecom was of the view that the 3.6 GHz band is very well suited to rural fixed wireless deployments, owing to its low susceptibility to attenuation resulting from precipitation. Reliable high speed connections can be provided at distances of up to and beyond 20 km. For this reason, the band is well suited to areas of low population density but only where there exists a clear line of sight to a high site from a large number of consumers. Ripplecom has undertaken trials of Next Generation Access (NGA) through wireless technology operating on licensed 3.6 GHz technology. The results are well in excess of the minimum speeds set out in the National Broadband Plan (NBP) which illustrates that this band is ideal for high speed rural broadband connectivity (see attached report on trial in Clonmel).

## 2 ComReg and NBP Processes

While understanding that ComReg operates independently and is the independent Regulator of the Telecommunications marketplace, Ripplecom is concerned that only passing references are made in this document to the NBP. The Department of Communications, Energy and Natural Resources (DCENR) are planning for an unprecedented market intervention in the rural marketplace. DCENR have published documentation which sets out that the NBP programme in its current guise will impact 700,000 residences in 96% of the landmass of Ireland. Given the manner in which the market has developed, it would have been assumed that any intervention of this scale would be undertaken with the Regulator involved in the process and after relevant spectrum licensing events had been decided upon.

However two processes, one by DCENR and the other by ComReg seems to be running in parallel with little or no correlation between them. Wireless operators are confused by this approach. We recommend that ComReg and DCENR should streamline their respective processes, with ComReg completing the spectrum allocation process first, then DCENR receiving plans from Wireless Operators for the commercial build-out of NGA networks and finally reviewing the mapping process to see where State intervention may be required under an NBP style arrangement.

## 3 The Auction Process

From a policy perspective, it is difficult to understand how ComReg can be discussing the type of auction it is going to undertake for spectrum allocation while at the same time DCENR maintains there is market failure. DCENR are planning a massive intervention in the marketplace – affecting over 700,000 premises spread across 96% of the land mass of the country. An underlying assumption of auctions in spectrum allocation is that there is a functioning competitive market within which the auction can be conducted. Both DCENR and the Minister for Communications clearly believe this is not the case.

The document 15/70 sets out its reasons why one type of auction process is favoured over other types. From a Ripplecom viewpoint (and this probably applies to all the WISP companies) we have no expertise in determining the benefits of one auction process over another and neither have we any understanding of the best way of being granted spectrum through an auction process. Auction processes usually come down to the 'size of the pocket' of that organisation. In our contribution to the consultation document 14/101, Ripplecom anticipated this issue arising and to summarise again the points made by Ripplecom against an auction process:

- Given their scale, WISPs cannot afford to go into an auction against large multinational telecommunications carriers and service providers with virtually limitless resources and hope to outbid them. The method of allocation of licensed spectrum of the 3.6 GHz band should shift from the companies with the deepest pockets who pay upfront fees, to those who provide services to a predetermined quality level at agreed rural locations, where the services are required.
- At present a 'digital divide' exists between urban and rural areas of the Ireland. This has been recognised by DCENR (The Minister for Communications has issued press releases concerning a €500m+ market intervention to provide broadband to rural areas). While understanding that this divide needs to be addressed, due recognition needs to be given to the numerous WISPs who have delivered services and 'filled the void' to rural communities over the past 15 years. These WISPs have invested significant capital and have infrastructure and site arrangements *in situ* at present. This infrastructure can quickly be upgraded should spectrum be awarded, while the larger telecommunications companies, who have focused on the highly lucrative urban markets during this time period, have a limited rural focus.

We believe that the ComReg 15/70 consultation has not taken these two critical points into account and we are of the view that an auction process is not the way to proceed at this point.

In our view an administrative allocation of some of this Band will be more appropriate. Ripplecom is of the view that a *portion* of the spectrum in rural areas should be designated primarily for FWA, where operators have expressed an interest in rollout of NGA equipment.

Various factors supporting this approach are outlined below:

- The relatively large amount of available spectrum.
- The national interest to deliver NGA broadband to as many rural premises as possible in the shortest timeframe and at the lowest impact to the taxpayer.
- The history of service provision by FWA providers. We contend that had it not been for ComReg decision 10/29 or had ComReg provided a much earlier consultation on the 3.6GHz spectrum then there would have been significantly greater investment in licensed FWA with significantly more competition and subscribers connected in rural areas. As it is, more that 60% of the known 74,000 WISP subscribers in Ireland are connected using license exempt equipment, largely for this reason. By ensuring adequate spectrum is made available (at a reasonable price) in large areas ComReg, can encourage investment in the sector which may significantly reduce the dependence on state subsidy in the NBP.
- Typically, the amount of spectrum required to deliver competitive mobile services is significantly less that the spectrum required to deliver competitive fixed services. The expectation of the consumer is that the mobile service will involve a relatively low usage cap (typically less than 30GB), whereas the expectation for fixed service is that there is no cap - or a relatively high one (e.g. 200GB). In addition, there is a stated intention to release other spectrum bands in the near future (2.3 and 2.6GHz) that are better suited to Mobile services and therefore likely to be economically out of reach for FWA providers.

Therefore, Ripplecom is of the view that it is inappropriate to award a significant amount of spectrum via an auction process to MNOs for use solely as capacity spectrum in hotspots in the larger towns within the rural regions. Due consideration must be given to the national interest in delivering NGA access to as many rural locations as possible, with the least impact to the taxpayer. Requirements for in-building capacity spectrum by MNOs could and should be met through an obligatory system of sub-leasing of spectrum for these purposes. We extend this point to highlight that it should not be permitted to acquire spectrum on the basis of the *potential* for future use and that any award should be based on presentation of clear evidence of concrete rollout plans. In meeting its statutory obligations, ComReg must ensure that these plans are real and substantiated.

It is for this reason that Ripplecom made further suggestions in its reply of 14/101 which again need to be reiterated – extract from 14/101;

> 'Ripplecom recommends that ComReg set out a number of conditions which would apply to companies who are awarded these licenses and which would need to be complied with, on an ongoing basis, to maintain the right to use the spectrum. This would ensure:
>
> - compliance with regulatory rules (both technical and administrative).
> - competency regarding the technical capability of the Company to operate in today's telecoms environment.
> - capability regarding the provision of a level of service commensurate with the objectives of the NBP.
>
> Ripplecom recommends that ComReg considered the following conditions that may apply to an award of spectrum:
>
> 1 Be registered with DCENR and ComReg as a telecommunications provider.
> 2 Following the acquisition of spectrum, be able to demonstrate that a minimum number of customers (number to be agreed) are being serviced within 12 months of the first allocation. This ensures that the allocated spectrum is being used for its intended purpose.

3 Maintain a residential customer base of at least 50% to ensure that the spectrum is not used solely to service higher paying Business Customers (which would result in rural customers remaining without broadband).
4 Be tax compliant and have up to date accounts filed with Revenue.
5 Be of a scale to operate a network across an RLA.
6 Have a core telecommunications network in place with sufficient transit capacity and a connection to Internet Neutral EXchange association (INEX) for peering with other service and application providers.
7 Offer both broadband and voice services.
8 Have the resources available or be able to demonstrate that the required resources can be raised in the marketplace to upgrade its current network to a licensed spectrum NGA platform within the next 18 to 24 months.
9 Have sufficient and appropriately qualified technical and operational staff commensurate with its customer base.
10 Fulfill all regulatory commitments including quarterly reporting to ComReg.
11 Have the ability/track record of providing wholesale services to other operators to ensure competition.'

## 4 Commentary on Plum Consulting Report

In section 5.74 of Comreg 15/70, an assertion is made that, based on responses to the earlier 14/101 paper, use of the 3.6 GHz band is likely to migrate towards the deployment of LTE Technology. Then in section 5.75 a Plum consulting report on "Analysis of the potential spectrum requirements for NGA services" released as Comreg document 15/75, is referenced in justifying a minimum cap level of 100MHz on the grounds that this would be required to provide NGA speeds (i.e. 30Mbps download). Ripplecom disagrees with both the above conclusions. Many WISPS including Ripplecom work with proprietary technology vendors and intend to continue doing so in the future. There is certainly no consensus within the WISP community that LTE Advanced technology is the only way to go for this spectrum. We also wish to highlight the fact that the 15/75 document was highly biased towards LTE Advanced technology which flies in the face of the goal to ensure technology neutrality in the spectrum usage.

Ripplecom engaged with our partners Cambium networks who develop proprietary wireless technology suitable delivering broadband services in the 3.6 GHz band. They studied the 15/75 document and prepared a comparison document with their own latest comparable product which we have included with this submission (cf. PlumLTEvsPMP450_0v4.pdf). Their analysis indicated that their current product could provide up to 30% more spectral efficiency than the LTE Advanced technology presented in the Plum report using similar assumptions. This in turn could lead to delivery of NGA services to significant percentages of the rural population with considerably less than 100MHz of bandwidth.

Ripplecom attaches a Cambium report entitled 'Comments on Comreg 15/75 LTE-A vs PMP450' to support our arguments.

## 5 Responses to Specific Issues Raised

The 15/70 Consultation asked for responses to specific consultation questions and below are Ripplecom's response to each of these questions:

| **4.5 Chapter 4 Consultation Questions** | **Ripplecom Response** |
|---|---|
| Do you agree with ComReg's preliminary views set out in Chapter 4 and, in particular, that: | |
| • the band plan for the 3 400-3 600 MHz sub-band should be TDD (in line with the preference expressed in the 3.6 GHz EC Decision); | Yes – The 3.6 GHz band should be TDD |
| • regions should be established in line with the principles identified by ComReg | The region model (option 2) proposed by ComReg is appropriate. We would strongly recommend that Comreg shares region map this with DCENR so they can correlate NBP lots with these region boundaries. |
| • the regions identified in Option 2 should be used for the proposed award | Again, yes if these regions are correlated with NBP award |
| • a licence duration of 15 years should apply to the 3.6GHz band. | No. We believe the duration should be at least the same as the proposed duration of the NBP contract which is currently 20 years. Having a licence duration less than NBP contract duration could effectively prevent the 3.6 GHz band from being used as part of any NBP tender submission. |

| **5.10 Chapter 5 Consultation Question** | **Ripplecom Response** |
|---|---|
| 5.146 Do you agree with ComReg's preliminary views set out in Chapter 5 and, in particular, that: | |
| • a combinatorial clock auction is the preferred auction format | Ripplecom has no prior experience of the differing auction formats. However from reading about the CCA process, it would seem to strongly favour larger companies trying to outbid smaller ones. Furthermore as set out above, Ripplecom is of the view that given that DCENR are actively pursuing massive intervention in the marketplace through the NBP, it is difficult to understand how ComReg is following an auction strategy for spectrum when this strategy assumes a functioning competitive marketplace, which is obviously not the case. |
| • a single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz; | Ripplecom understands the logic of this recommendation but have no particular opinion either way. |

| | |
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| • Sixty five (65) frequency-generic lots of 5 MHz each should be adopted for frequencies between 3475 MHz – 3800 MHz; | Ripplecom would prefer a minimum lot size of 20 MHz is used. This would enable 16 lots of 20MHz be auctioned. |
| • a competition cap should be set and, further, that such a cap be within the range of 150 MHz to 250 MHz. ComReg is mindful of the alternative uses to which this spectrum can be put and the potential impacts this can have on competitive dynamics in the relevant market concerned (for example fixed of mobile). Accordingly, ComReg welcomes input on any other factors which should be taken into account when establishing the level of any competition cap; | Ripplecom suggests that a cap of 100MHzshould apply, particularly for the first 2 to 3 years and thereafter the opportunity to acquire additional spectrum would be dependent on the Operator achieving defined targets. Criteria might include network performance, number of subscribers connected etc.<br><br>Rollout obligations should apply to successful bidders and failure to comply within specified timeframes should result in loss of access rights to spectrum |
| • benchmarking be used as the approach by which to determine a conservative minimum price; | Ripplecom is of the view that because the Irish situation is unique in Europe both in terms of the distribution of our rural population and the proposed government intervention via NBP, benchmarking should not apply in this case. The latter in particular skews the market considerably in Ireland so international benchmarks on 3.6GHz spectrum pricing cannot be applied.<br><br>Furthermore failure to invest by previous governments has led to a large number of relatively small privately owned FWA operators in Ireland today who cannot afford international market rates for 3.6GHz spectrum. |
| • the minimum price should be apportioned on a 50/50 basis between an up-front payment (SAF) and ongoing annual payments subject to CPI index linking (SUFs); | Ripplecom is of the view that the 50/50 (SAF/SUF) is not appropriate. Given the financial position of many of the smaller players, it is more in keeping to align payments for the use of spectrum with the related income received from customers using the spectrum. Therefore Ripplecom is of the view that a split of 20/80 (SAF/SUF) is more appropriate. |
| • the range €0.015 to €0.025 per MHz per capita is appropriate for the setting of the minimum price, with the higher end of the range applying to urban areas and the lower end applying to regions that do not have specific urban areas identified. | Ripplecom is of the view that the economies involved in fixed wireless networks are significantly different from those of MNOs. The proposed pricing structure by Comreg appear to acknowledge this where a minimum price of €0.015 is proposed for rural regions vs. €0.025 for urban.<br><br>However this does not go far enough. Given that DCENR are proposing massive Government |

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| | intervention due to perceived 'market failure' it would seem appropriate in the national interest, to reduce the SAF (up-front payment) to operators who indicate an intention and ability to deliver NGA services in rural areas. ComReg can easily ensure the legitimacy of such operators by specifying rollout obligations.<br><br>Setting the minimum price of a region based on an assumption of full coverage of the population within that region is false. The population covered is more accurately determined by an analysis of coverage from known mast sites.<br><br>ComReg report that there are 120-170 BS currently in the rural regions, each with an FWALA service area of 314km$^2$. This gives a total coverage area of approx 45,000 km$^2$. However many of these BS are in close proximity to each other so the real coverage is likely less than 30,000km$^2$, less than 40% of the area of the country.<br><br>It may be possible to develop new high sites but these are likely to be of lesser economic value in connecting additional subscribers. In addition, although the population density is likely greater in the existing FWALA coverage areas, due to the LoS nature of 3.6GHz it is also clear that fixed wireless can connect to significantly less than 100% of premises in these coverage areas.<br><br>In deriving the minimum price, the population numbers that may be potential customers for FWA in rural areas should exclude the population of larger towns where there is access to fibre or cable technologies or where access to fibre is planned to be available in the near term. Indeed given the recent announcement by Eircom and the proposals of the NBP, the subscriber base that may be connected by NGA FWA is likely to reduce significantly between now and 2020.<br><br>All of this would greatly reduce the population number used to determine the minimum price point. |
| • the population of each of the regions under Option 2 should be adjusted to take account of the commuter flows between the five identified cities and the other applicable regions. | Ripplecom's view of population numbers as a means of setting prices has been set out in the point above. |

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| 6.8 Chapter 6 Consultation Question | Ripplecom Response |
|---|---|
| 6.142 Do you agree with ComReg's preliminary views set out in Chapter 6 and, in particular, that: | |
| • the band should be released on a service- and technology-neutral basis | Yes, Ripplecom supports this general principle. Ripplecom notes that Comreg 15/75 report from Plum Consulting released in conjunction with Comreg 15/70 seemed to be strongly biased towards exclusive use of LTE-TDD technology for this band. Apart from the fact that this seems to go against the technology neutral principle, Ripplecom has received analysis from a vendor of proprietary wireless technology to indicate that their solutions may be more spectrally efficient than LTE-Advanced. |
| • rights of use in the band should be awarded on a non-exclusive basis; | Yes, Ripplecom supports the rights of use should be awarded on a non-exclusive basis subject to interference conditions being met. |
| • an obligation to notify of the termination of a technology should apply | Yes, Ripplecom supports the obligation to notify of the termination of a technology and suggest that a six months obligation should apply at a minimum. |
| • a rollout obligation should apply for spectrum rights of use in this band and that such an obligation should be based on a minimum number of base stations to be deployed per sub-national region | Yes in principle, Ripplecom agrees with this proposal but would need to see more details of this exact proposal. Where rollout obligations are not being met, either the licence could be withdrawn or the licensee may be obligated to sub-licence to Operators who will roll-out.<br>Also the term "base station" needs to specifically exclude Small Cells (aka Femto Cells) which although are technically base stations but which provide little or no outdoor coverage. Any MNO could quickly deploy hundreds of Small Cells in a region at very little cost to meet this obligation. However only a tiny minority of the population in that region would benefit. |
| • a quality of service obligation should apply in relation to each of network availability and voice call standards; | Yes but it should not be more onerous than NBP requirements |
| • licensees should internalise guard-bands as spectrum should be assigned without guard-bands; | Yes Ripplecom agrees with this point |

| | |
|---|---|
| • a default TDD frame-structure based on TD-LTE configuration 2 (3:1) should be applied to incentivise inter-network synchronisation; | While Ripplecom agrees in principle with encouraging inter-network synchronisation, we also feel strongly that nothing should be enforced that places non LTE solutions at a disadvantage to LTE based solutions. Allowance should also be made for customers (e.g. businesses) that may require synchronous services (i.e. equal DL and UL bandwidth) |
| • a permissive BEM should apply to synchronised networks and a restrictive BEM should apply to unsynchronised networks; | Yes, Ripplecom agrees with this point |
| • the terminal station in block power limit set out in the 3.6 GHz EC Decision should be relaxed for fixed outdoor installations; | Yes Ripplecom agrees with this point |
| • at regional borders a coordination threshold should apply to allow for bilateral/multilateral co-existence agreements; | Yes Ripplecom agrees with this point |
| • where agreement in cross-border coordination fails to be met, the coordination threshold limit should be set as a binding licence condition. | Yes Ripplecom agrees with this point |

| **7.4 Chapter 7 Consultation Question** | **Ripplecom Response** |
|---|---|
| 7.74 Do you agree with ComReg's preliminary views set out in Chapter 7 and, in particular, with the following proposals: | |
| Transition Proposal 1: the formulation of a transition plan for the 3.6 GHz band; | Ripplecom supports the proposal that all existing licensees are involved in the process to determine a 3.6 GHz transition plan. |
| Transition Proposal 2: the Transition Protected Licence; | Yes. It is presumed that under a transition license (protected or unprotected) that an operator will be authorized to continue to |

| | |
|---|---|
| | provide services using the current FWALA band plan, equipment and conditions of use. |
| Transition Proposal 3: the Transition Unprotected Licence | It is presumed that under a transition license (protected or unprotected) that an operator will be authorized to continue to provide services using the current FWALA band plan, equipment and conditions of use.<br><br>In the case of the transition unprotected license it is assumed that the operator would be protected from interference by unlicensed transmission and that the operator could continue to avail of ComReg's compliance resources to investigate and resolve any such issues.<br><br>Under the terms of the Transition Unprotected License we suggest that the specific frequency assignment is a matter that should be arbitrated by ComReg on a case by case basis prior to the license issue. There are significant differences in the frequency agility of 3.6GHz equipment. An existing licensee may have deployed equipment with customers which may have a fixed range of operation within a 30 or 40MHz section of band, whereas much of the NGA equipment that would likely be deployed under a new license is capable of operating in any contiguous block of the proposed frequency plan, in 5, 10, 20, 40MHz or higher bandwidths.<br><br>Regarding the duration of a Transition Unprotected license our view is that this should not necessarily have a maximum term. ComReg should allow flexibility in this regard and determine when and if a license should be terminated based on market conditions. We suggest that a licensee operating under a transition unprotected license should be given a minimum of 18 months notice of the termination of the license in order to minimise consumer disruption and to allow for transition arrangements for those consumers to alternative provider(s).<br><br>Given the national interest in providing high speed wireless services to the maximum number of rural consumers, and in terms of maximising competition in the market, it seems contradictory that on the one hand DCENR is proposing to provide state aid to provide fibre |

| | |
|---|---|
| | services to each premises, whereas ComReg is proposing to increase FWALA fees. As a result we would advocate that there should be no fee increase for transition unprotected FWALA licenses. |
| Please provide a detailed explanation of your views, with supporting material, having regard to ComReg's statutory functions, objectives and duties. | In setting out its proposals for Transition Plans and timelines ComReg has made reference to the MBSA process. However we would point out that transition issues for Fixed wireless services are significantly different to mobile services. In the case of mobile services it may be presumed that the CPE devices (handsets) will incrementally be changed by the subscriber base over time to avail of the new services or bandwidth provided by the operator. In the case of FWA truck rolls may be required to each subscriber premises. In a situation where an operator is planning to upgrade equipment in a certain sector and where there may be several hundred subscribers in that sector then in order to provide continuity of service the operator would have to<br><br>1. Upgrade the BS with the new equipment, transmitting in alternative "turning space" spectrum.<br><br>2. Implement a plan to replace equipment at each CPE premises, requiring truck rolls to each location<br><br>3. Once all CPE equipment had been replaced then turn off the "old" BS transmitter for that sector and retune the "new" BS equipment to the final frequency assignment.<br><br>4. The operator would have to continue steps 1-3 for all other sector transmitters at the BS.<br><br>Given all of this it is likely that the timeframes involved would not be equivalent to those in the MBSA process. |

## 6 Conclusion

Ripplecom believes that this consultation process is very important to maintain competition in the broadband marketplace in Ireland.

WISP companies have serviced the rural market for the past 15 years and have filled a void left by the bigger telecommunication companies. Depending on the outcome of the 3.6 GHz spectrum award, Ireland could have a vibrant competitive marketplace with smaller companies providing NGA standard service which fulfils one of the objectives of both ComReg and the State (i.e. to have active competition in the marketplace). This localised service will provide competition to the big players. On the other hand, if the 3.6GHz is auctioned to the highest bidder and with the focus of DCENR apparently on awarding national contracts to a company or companies who have the ability to roll out fibre based connections to over 700,000 rurally based premises over a 3 to 3.5 year period, competition in the marketplace will be much diminished.

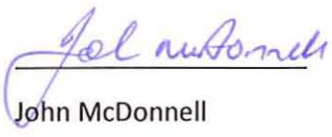
In the current consultation documents, 15/70, ComReg are focused on running an auction for the allocation of 3.6 GHz spectrum. An underlying assumption of auctions in spectrum allocation is that there is a functioning competitive marketplace. However, the basis of the DCENR NBP process, is that there is market failure in a very large area of the map and that the Government must intervene in this marketplace to ensure that adequate capital is invested to bring services up to a minimum standard by 2020.

In addition given the national interest in providing high speed wireless services to the maximum number of rural consumers and in terms of maximising competition in the market, it seems contradictory that on the one hand DCENR is proposing to provide state aid to provide fibre services to each premises, whereas ComReg is proposing to increase FWALA fees. As a result we would advocate that there should be no fee increase for transition unprotected FWALA licenses.

Ripplecom is of the view that the approach by the two processes is inconsistent and re-iterate our view that ComReg should complete the spectrum allocation firstly before the NBP is finalised.

Please acknowledge receipt of this submission via email.

Yours sincerely,



John McDonnell

**Managing Director**

Cambium Networks

# Comments on Comreg 15/75 LTE-A vs PMP450

N. J. R. King

August 27, 2015

Ref: PMP-1154/NJRK

Version: 0.4

**Abstract** — Computes the efficiency of LTE-A vs PMP450 using the Plum Report Comreg 15/75 as a basis.

Click for latest version of this document

| Version | Date | Change | Author |
|---|---|---|---|
| 0.4 | 2015-08-27 | Incorporate review comments from Mark Thomas. | Nigel King |
| 0.3 | 2015-08-27 | Corrected some typos, clarified section numbers and provided a conclusion. | Nigel King |

## Contents



# 1 Introduction

Plum produced a report ComReg 15/75 for Commission for Communications Regulation of Ireland to assist the Spectrum Award Process for 3.6GHz. They used LTE-A as an example of modern efficient wireless technology. This Document compares the number of users which a base station can support for LTE-A, with the number of users which a base station can support for PMP450 using section 3 of the Comreg document as a basis.

This document does not comment on the conclusions of the Comreg Report.

# 2 Comments on ComReg 15/75 Section 3

In this section I prefix the section numbers and titles from the Plum report with P. Section 3 of Plum performs the main analysis for LTE-A. I compare the Plum analysis with the same analysis for PMP450.

## P.3.1 Introduction

No comment.

## P.3.2 Quantifying the available bit rates

The same factors apply for the consideration of PMP450.

### P.3.2.1 Path Loss

Both LTE-A and PMP450 use Adaptive Coding and Modulation (CQI.MCS) to maximise the data throughput (in bits per second or bps), depending upon the signal to noise ratio of the received signal, which in turn depends on the quality of the radio link.

| **Modulation** | **Spectral Efficiency** | **LTE-A** | **PMP450** |
|---|---|---|---|
| **QPSK** | **2bps per Hz** | Available | Available |
| **16QAM** | **4bps per Hz** | Available | Available |
| **64QAM** | **6bps per Hz** | Available | Available |
| **256QAM** | **8bps per Hz** | Not Available | Available |

**Table 1** Modulations used by technology.

The coding rates for LTE-A vary from 1/8 to 4/5. The coding rates for PMP450 are 72/92 for data and 36/92 for control.

The values of spectrum efficiency for LTE-A vary from 0.15 to over 5 bps per Hz. The values for PMP450 vary from 0.25 to over 6 bps per Hz.

The system selects an appropriate Modulation and Code Rate (CQI/MCS) for the communication in LTE-A there are 15 CQI, in PMP450 there are 4 MCS for data. The selection of MCS is very fast in PMP450 and is based upon fragment success.

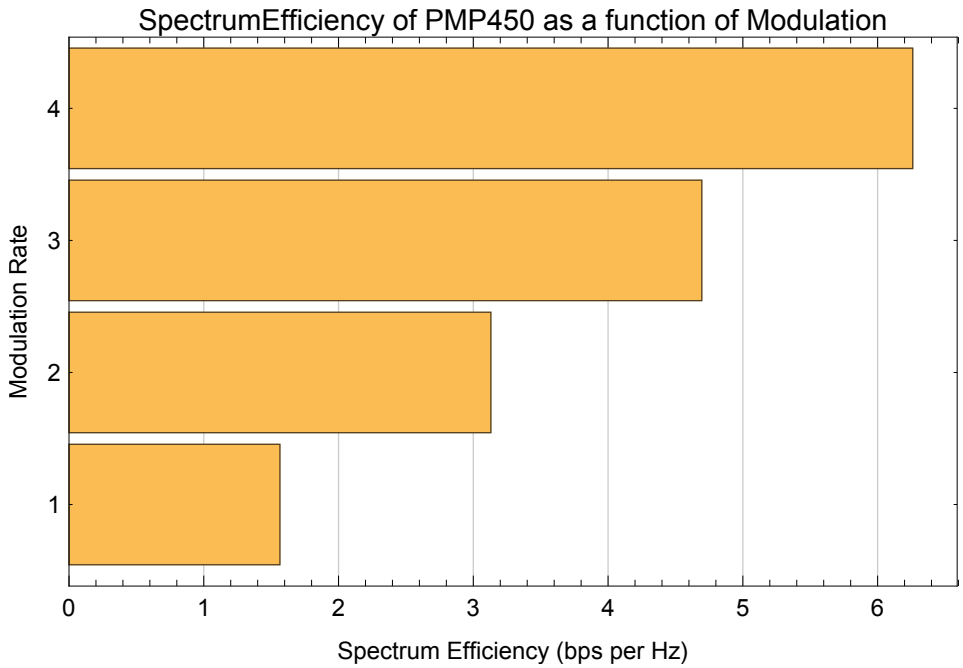



**Figure 1** Spectrum Efficiency of PMP450 as a function of Modulation

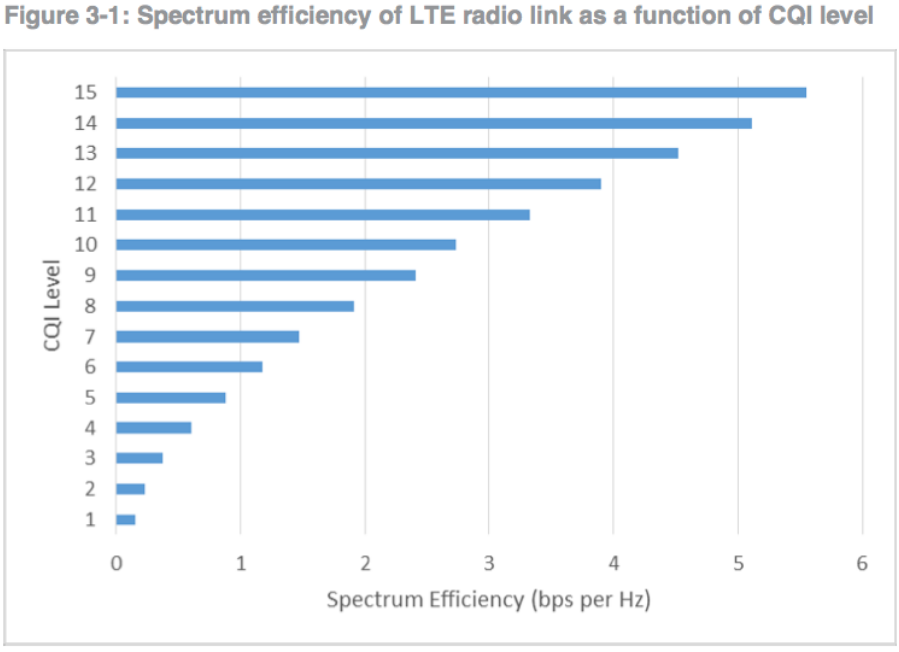



**Figure 2** Spectrum Efficiency of LTE-A as a function of Modulation (From Plum)

## P.3.2.2 Channel Width

LTE-A allows for 1.4, 3, 5, 10, 15 and 20MHz with the latest version of the standard enabling bandwidth up to 100MHz.

PMP450 has 5, 7, 10 and 20MHz bandwidths with the latest hardware capable of 40MHz bandwidth.

## P.3.2.2 Split between uplink and downlink traffic

LTE-A supports 1:3, 3:5, 1:1, 2:1, 3:1, 7:2 and 8:1.

PMP450 in 20MHz bandwidth supports almost any ratio from a total 81 data symbols depending upon maximum cell range, thus at short cell range 4/77 through to 77:4 are supported.

## P.3.2.4 Base station and CPE antenna characteristics

The LTE-A assumption is that there are 4 sectors using one frequency, I am surprised by the assertion that antenna discrimination allows frequency reuse in the adjacent sector. On the boundary between two sectors the interference equals the signal and so the maximum spectrum efficiency that may be used is about 0.5 for the best coding. And so, the reuse does not increase capacity accordingly for LTE-A. Section 3 addresses this point.

For PMP450 and a quad-sectored site, one can use two frequencies only in an ABAB configuration. A tri-sectored site needs 3 frequencies and a hex sectored site needs 3 frequencies in an ABCABC configuration. These options are fully available in the PMP450 system.

Figure 3 shows the response of a high quality sector antenna that may be used for 120° or 90° base sites.

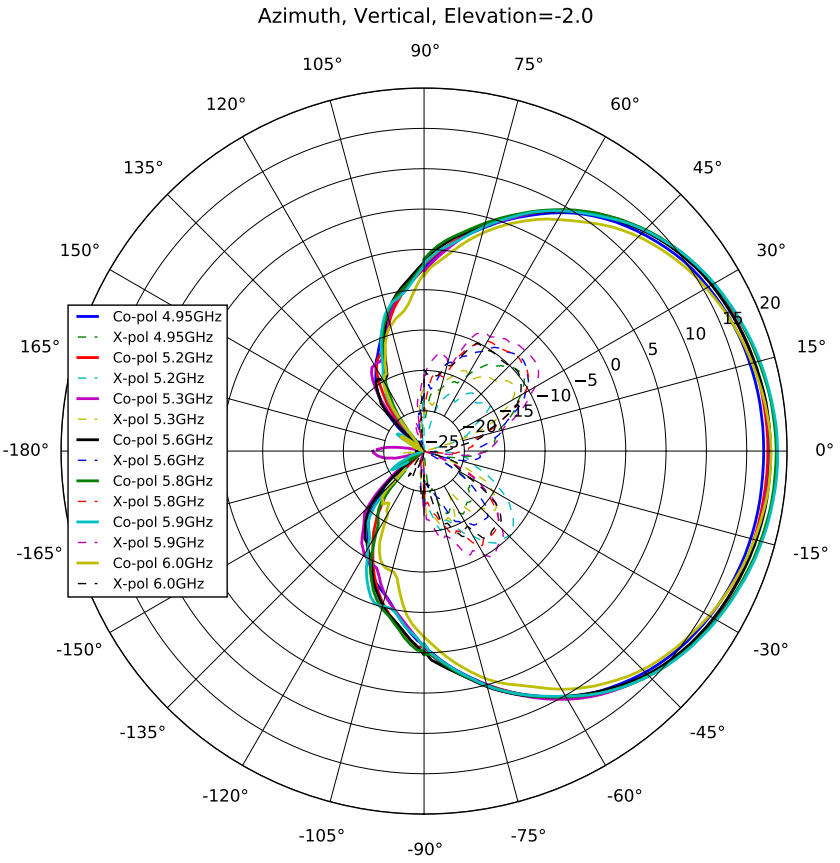



**Figure 3** A High Quality Sector Antenna

## P.3.2.5 Impact of MIMO deployment

In the PMP450 system the use of 2×2 MIMO doubles the the throughput. The system has available to any particular path the use of the paths separately or together. Separately doubles the throughput while together provides very significant diversity gain. This fact is proven in many deployments.

I note by contrast that the use of 2×2 MIMO in LTE-A only claims 50% increase in throughput.

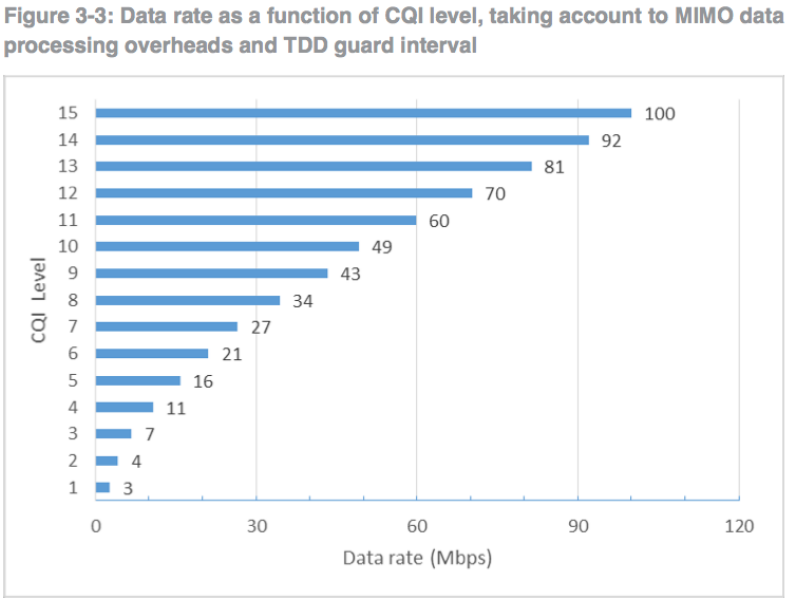



**Figure 4** LTE Data rate as a function of CQI level, taking account to MIMO data rate, signal processing overheads and TDD guard interval (from Plum)

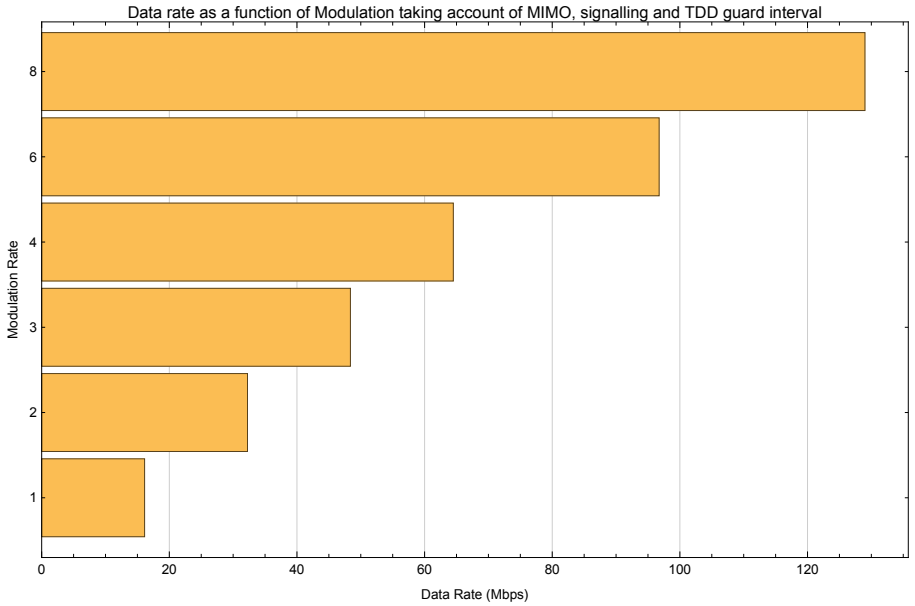



**Figure 5** PMP450 Data rate as a function of MCS level, taking account of MIMO, signalling and TDD guard interval

## P.3.2.6 Network Planning Considerations

The reference is incorrect and should be ITU-R P.1410-07.

For PMP450;

- 80% of connections achieve 129 Mbps / 20 MHz (based on highest modulation of 8)
- 20% of connections achieve at least 32 Mbps / 20 MHz (based on minimum modulation level of 2)
- Overall throughput spectrum efficiency = (0.8x129 + 0.2x32) = 109 Mbps / 20 MHz.

While LTE-A achieves:

- 80% of connections achieve 100 Mbps / 20 MHz (based on highest CQI level 15)
- 20% of connections achieve at least 34 Mbps / 20 MHz (based on minimum CQI level of 8)
- Overall throughput spectrum efficiency = (0.8x100 + 0.2x34) = 87 Mbps / 20 MHz.

## P.3.2.7 Estimating Base Station Throughput and Capacity

As stated in the previous section the four-sectored LTE-A base station will not achieve 4×87=358Mbps because of the inter-sector interference has not been accounted for. I will work out an expected number using the antenna characteristic in figure 3. It will be greater than 2×87=179Mbps and less than 358Mbps. I have done this in section 3

PMP450 uses a frequency use of ABAB on a four sectored site and so we are able to give a value of 2×109=218Mbps per 20MHz bandwidth. 436Mbps for the base station but using a total of 40MHz of spectrum.

The number of users for the quad-sectored base station is 436/(30/8)=116 using 40MHz of spectrum.

I do not agree with the LTE-A number of users in this section because it takes no account of the inability to create adjacent sectors which have no interference when using the same frequency. The next section 3 recomputes the capacity of an LTE quad sectored base station.

# 3 LTE Spectral Efficiency in a Quad Sectored Site

Taking the antenna of figure 3 and published theoretical data for LTE in table 2

| CQI Index | Modulation | Code Rate × 1024 | Efficiency | SNR@$10^{-2}$ BLER (dB) |
|---|---|---|---|---|
| 1 | QPSK | 78 | 0.1523 | -6.0 |
| 2 | QPSK | 120 | 0.2344 | -4.0 |
| 3 | QPSK | 193 | 0.3770 | -2.5 |
| 4 | QPSK | 308 | 0.6016 | -1.0 |
| 5 | QPSK | 449 | 0.8770 | 1.5 |
| 6 | QPSK | 602 | 1.1758 | 3.0 |
| 7 | 16QAM | 378 | 1.4766 | 5.5 |
| 8 | 16QAM | 490 | 1.9141 | 7.0 |
| 9 | 16QAM | 616 | 2.4063 | 9.0 |
| 10 | 64QAM | 466 | 2.7305 | 11.0 |
| 11 | 64QAM | 567 | 3.3223 | 12.7 |
| 12 | 64QAM | 666 | 3.9023 | 14.5 |
| 13 | 64QAM | 772 | 4.5234 | 16.5 |
| 14 | 64QAM | 873 | 5.1152 | 17.0 |
| 15 | 64QAM | 948 | 5.5547 | 21.0 |

**Table 2** Published data for efficiency and SNR by CQI

The antenna theoretical polar gain characteristic for a quad sectored site diagram is in figure 6. You will note that each lobe is quite similar to the measured polar pattern in figure 4.

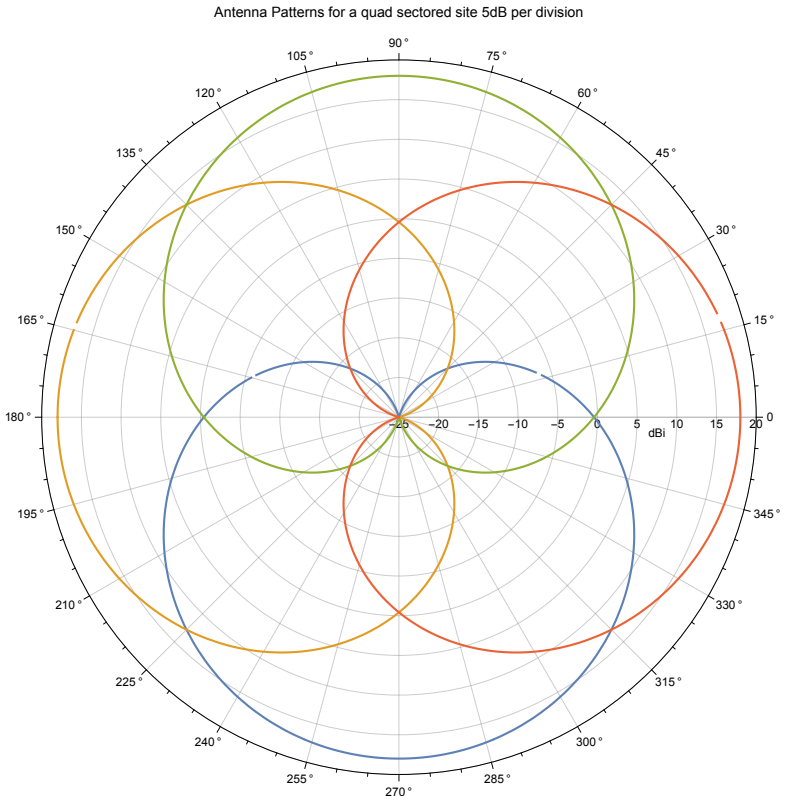



**Figure 6** The polar diagrams of the 4 antennas of a quad sectored site

At full capacity transmissions will occur on all four sectors and so the C/I for the SMs positioned can be computed subtracting the wanted antenna gain from the power sum of the unwanted antenna gains. A plot of this is shown in figure 7. The mean value is 9dB which would give about 2.4bps per Hz spectral efficiency.

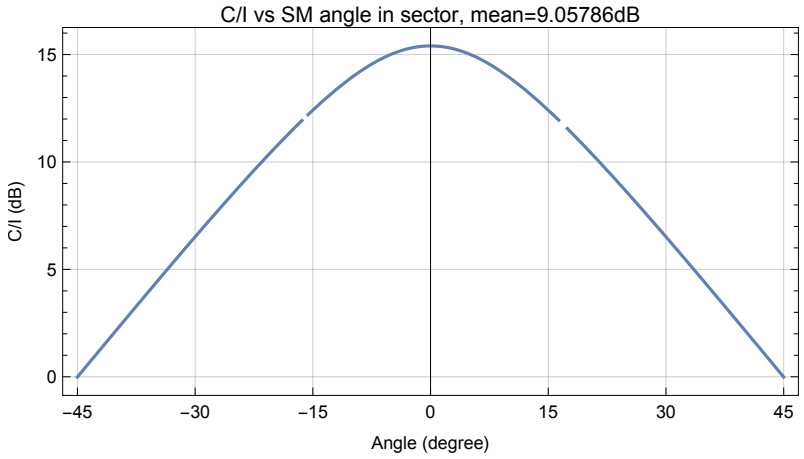



**Figure 7** C/I vs SM angle in sector

Computing the capacity which each SM can use for SMs positioned across the sector is shown in figure 8. This graph highlights two problems;

- The mean (2.3) is much lower than the assumed value of 80% of 5.5524=4.44
- the minimum (0.6×20=12Mbps) is too low to support 30Mbps

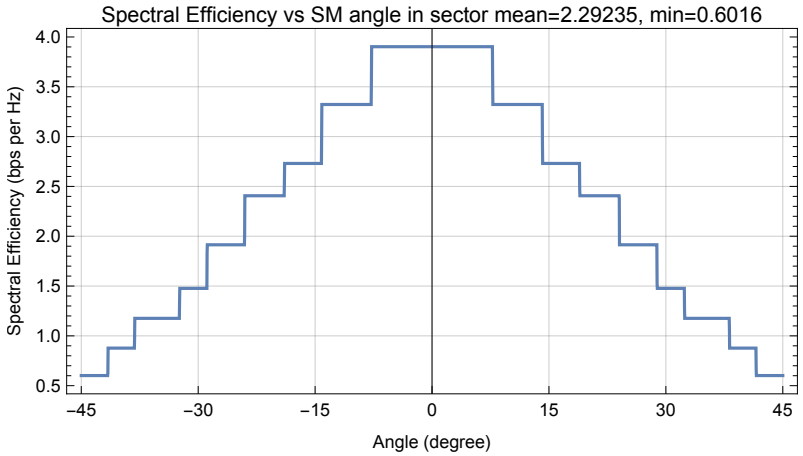



**Figure 8** Efficiency vs SM angle in sector

The Mean spectral efficiency is 2.3 bps per MHz. The mean throughput for the sector is then 87×2.3/5.5547=36Mbps. As stated in Comreg 15/75 Section 3.2.2 multiple simultaneous high bit rate services (30Mbps) are required from a single transmitter.

The LTE-A solution will be to use two frequency reuse (ABAB) as is recommended for PMP450. Now 88 LTE-A users can be connected using 40MHz of spectrum. Compare this with 116 PMP450 users using 40MHz of spectrum.

# 4 Conclusion

Report Comreg 15/75 has been analysed and a comparison made between the performance of LTE-A and the performance with PMP450. After correcting an error in the LTE-A analysis PMP450 is shown to have 30% greater spectral efficiency the LTE-A.


# Can Fixed Wireless deliver Next Generation Access speeds ?

Diarmuid Ó Briain, CEng, FIEI, FIET

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# Table of Contents



## Illustration Index



## Index of Tables

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# 1. National Broadband Plan

The Department of Communications, Energy and Natural Resources (DCENR) launched 'Delivering a Connected Society - A National Broadband Plan (NBP) for Ireland'[1] in August 2012. The plan based on the European Commission's 'Digital Agenda for Europe'[2] requires the delivery of at least 30 Mb/s connectivity for all citizens. The plan targets are;

- 70 Mb/s – 100 Mb/s available to at least 50% of the population with a majority having access to 100 Mb/s;
- At least 40 Mb/s, and in many cases much faster speeds, to at least a further 20% of the population and potentially as much as 35% around smaller towns and villages; and
- A minimum of 30 Mb/s available to all.

It is expected that the minimum target upload speeds will be in the region of 25% to 30% of the headline download speeds.

The DCENR carried out a mapping exercise to identify where the target was already reached and the areas yet to meet the target.

A 'Call for Input (CFI) on Key Aspects of the State-Led Intervention' Document No: NBP-TL-0001[3] was released by the DCENR on the 25 April 2014 to allow interested stakeholders the opportunity to make submissions with regard to the plan in the context of state led intervention rules.

1 Department of Communications, Energy and Natural Resources (2012). Delivering a Connected Society - A National Broadband Plan for Ireland. Dublin, 30 Aug 2012.
2 European Commission (2010). COM(2010) 245: Digital Agenda for Europe - Pillar IV: Fast and ultra-fast Internet access. Brussels, 19 May 2010.
3 Department of Communications, Energy and Natural Resources (2014). NBP-TL-0001: National Broadband Plan. Call for Input On Key Aspects of the State-Led Intervention. Dublin, 25 April 2014.

# 2. Remote homes and wireless

The initial NBP document identified that, in the absence of any Government intervention, there will be a gap in more rural and isolated areas, with between 15% and 30% of the population continuing to have only basic broadband services (speeds are not expected to exceed 5 Mb/s in these harder to reach areas and could be significantly lower). Such areas are typically served by Wireless Internet Service Providers (WISP) using Fixed Wireless Access (FWA) solutions in both the 3.6 GHz Fixed Wireless Access Local Area (FWALA) and 5 GHz Industrial, Scientific and Medical (ISM) radio bands.

A consequence of the state led intervention rules is that the NBP must be technology-neutral. The distributed nature of the Irish population means that while a fibre roll-out is desirable it has been shown in other jurisdictions like the United Kingdom (UK) that it is not economically viable to meet the demand of remote rural homes and businesses. In the UK it is estimated, for example, that the cost of deploying superfast broadband to the last 10% of households is up to three times higher than the first two-thirds of the population[4].

Such remote homes present an opportunity to receive Next Generation Access (NGA) speeds within the NBP targets using FWA.

# 3. Ripplecom NGA Trial

Ripplecom is a leading Internet Service Provider (ISP) and has significant experience with FWA. Upon consideration of the NBP Ripplecom Engineering was tasked with;

- Identification of a suitable Radio platform for NGA; and
- Conducting a trial of the chosen platform to prove its credentials.

4 European Commission (2012). State aid SA.33671 (2012/N) – United Kingdom National Broadband scheme for the UK - Broadband Delivery UK. Brussels, 20 Nov 2012.

## 3.1 Cambium PMP450

*Illustration 1: PMP450*

After reviewing a number of vendors Ripplecom decided upon Cambium Networks as the partner of choice to deliver a suitable NGA platform. Cambium Networks are proven, respected leaders in the wireless broadband industry. They build innovative data, voice, and video connectivity solutions across all geographies. Ripplecom had experience with the Canopy family of products and chose the PMP450[5] family shown in Illustration 1 for the NGA trial due to its advanced Orthogonal Frequency Division Multiplexing (OFDM) and Multiple-Input and Multiple-Output (MIMO) antenna systems. Also with the synchronisation capability of the PMP450 Access Point (AP) it is possible to build clusters of 6 APs, each with 125 Mb/s throughput giving a throughput of 750 Mb/s per cluster.

At the customer site a PMP450 Subscriber Module (SM) is installed with scalable capacity up to 75 Mb/s.

5 Cambium Networks (2015). PMP 450: High Performance, Synchronization and Low Latency. Available: http://www.cambiumnetworks.com/products/pmp/pmp-450 accessed: 2 July 2015.

## 3.2 NGA parameters

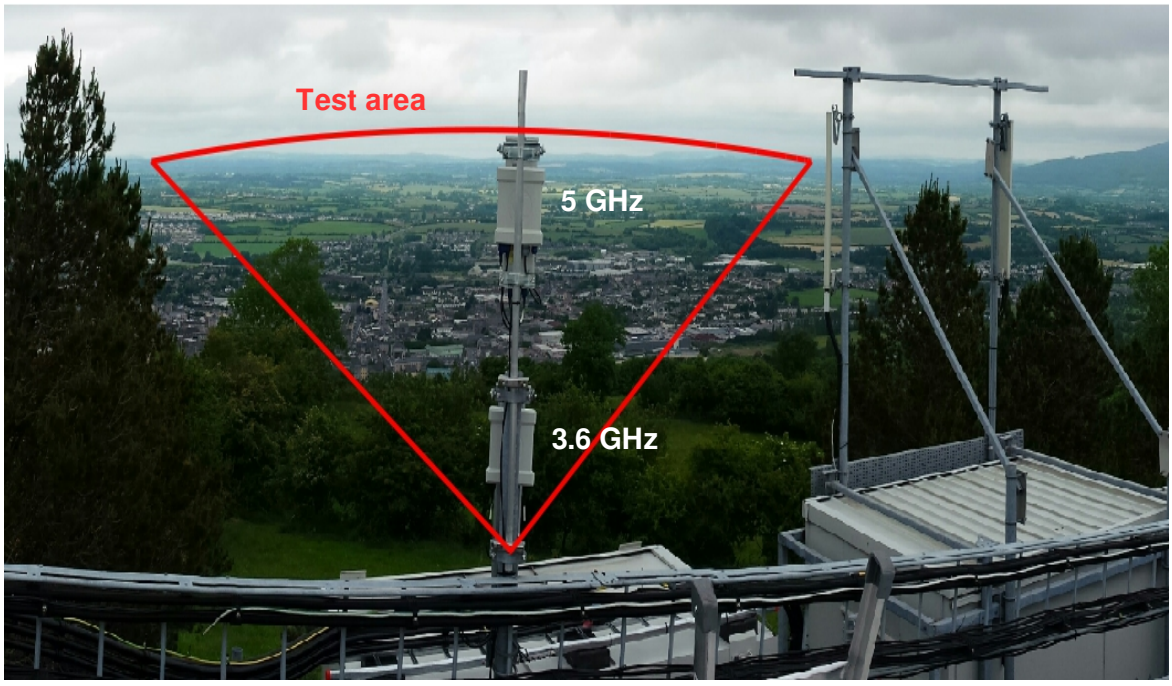


*Illustration 2: NGA Trial area*

After some discussion and a series of meetings with the vendor it was decided to trial both 3.6 GHz FWALA and 5 GHz ISM as the PMP450 family has solutions for both bands. A trial license was obtained from the Commission for Communications Regulation (ComReg) for channel C in the area of Clonmel in South Tipperary and as shown in Illustration 2. This channel was designed for Frequency Division Duplex (FDD) originally and is in two 25 MHz blocks 3610 - 3635 MHz and 3710 - 3735 MHz. For the trial we decided to use a 20 MHz channel from 3610 – 3630 MHz with a centre frequency of 3620 MHz. In the 5 GHz band we chose 5825 MHz again with a 20 MHz channel.

## 3.3 The test Area

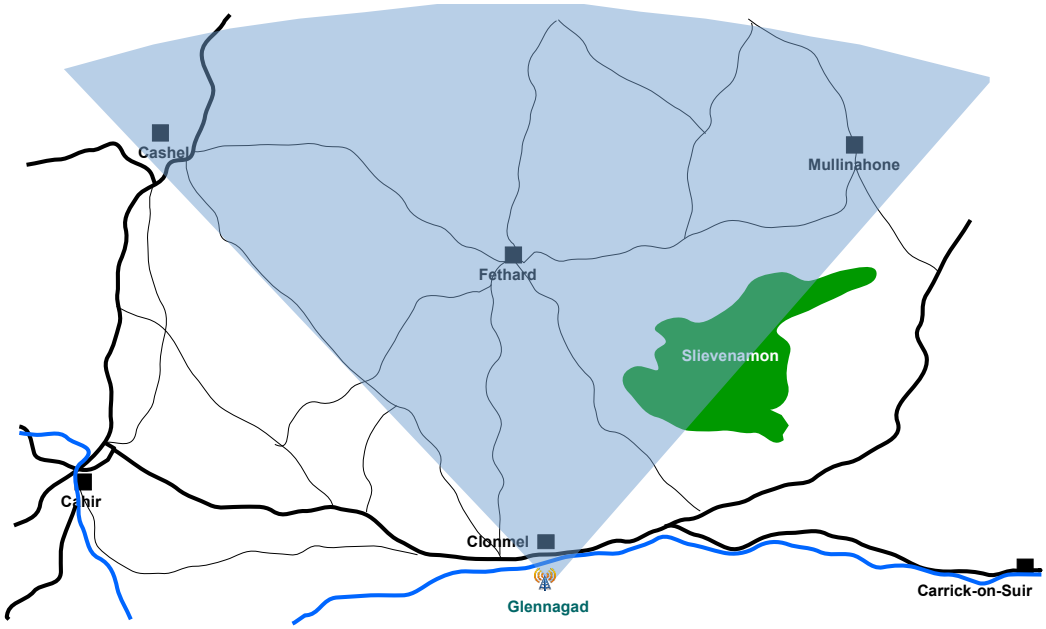


*Illustration 3: The NGA test area*

The test area shown in Illustration 3 is that area north of Clonmel bounded by Cashel to the west and Slievenamon to the east. The two PMP450 APs, on on 3.6 GHz and the other on 5 GHz with 60º degree sector antennas pointing north in the rough direction of the town of Fethard.

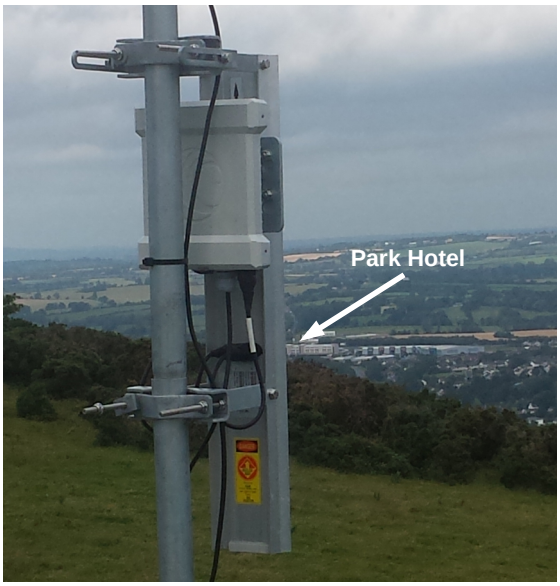


*Illustration 4: Park Hotel nLOS*

Initial tests were carried out from the Park Hotel roof in Clonmel which represented a relatively local distance of 2.5 Km from the AP but can also be considered a near Line of Sight (nLOS) condition with the edge of the hill within the Freznel zone as can be seen from Illustration 4 and also it is a location outside the western edge of the nominal sector area. This represents a good initial test before progressing to the more detailed analysis of the area. This offered a challenging nLOS and sector edge condition.


*Illustration 5: Park Hotel in relation to nominal 60° Sector coverage*

## 3.4 3.6 GHz FWALA result

This initial test proved encouraging with an over the air Downlink/Uplink of ~ 87/21 Mb/s in the Cambium results window in Illustration 6 and an Downlink/Uplink to the Internet of ~ 63/20 Mb/s shown on the OOKLA speed-test result in Illustration 7 below.

Current Results Status

Stats for LUID: 6 Test Duration: 10 Pkt Length: 1500 Test Direction Bi-Directional

**Link Test with Bridging**

| VC | Downlink | Uplink | Aggregate | Packet Transmit | Packet Receive |
|---|---|---|---|---|---|
| | | | | Actual | Actual |
| 22 | 86.78 Mbps | 20.87 Mbps | 107.66 Mbps, 8754 pps | 16966 (1696 pps) | 70580(7058 pps) |

**Efficiency**

| Downlink | | | Uplink | | |
|---|---|---|---|---|---|
| Efficiency | Fragments count | | Efficiency | Fragments count | |
| | Actual | Expected | | Actual | Expected |
| 99% | 1695499 | 1695072 | 100% | 407710 | 407710 |

**Currently transmitting at:**
VC 22 Rate 8X/6X MIMO-B

*Illustration 6: 3.6 GHz Radio link test result*

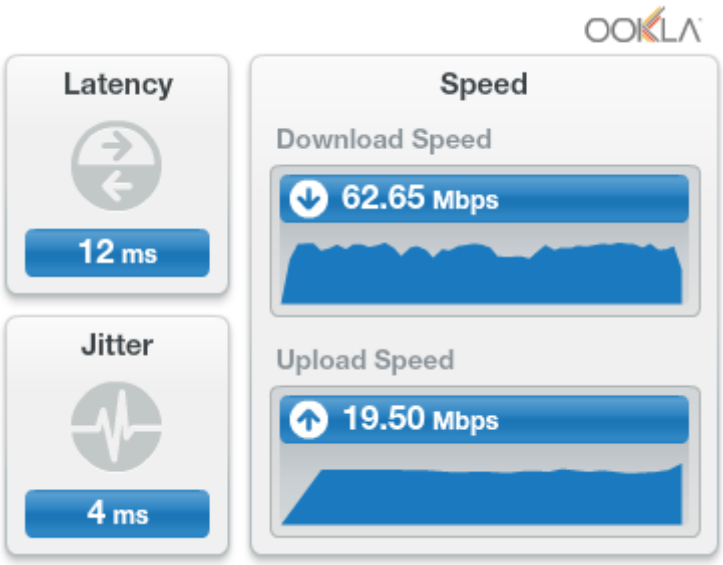


*Illustration 7: 3.6 GHz speed-test*

## 3.5 5 GHz ISM band result

Like the 3.6 GHz, the 5 GHz test also proved encouraging with an over the air Downlink/Uplink of ~ 44/14 Mb/s as demonstrated in Illustration 8 and an Downlink/Uplink to the Internet of ~ 42/14 Mb/s shown on the OOKLA speed test in Illustration 9 below.

Current Results Status

Stats for LUID: 5 Test Duration: 10 Pkt Length: 1500 Test Direction Bi-Directional

**Link Test with Bridging**

| VC | Downlink | Uplink | Aggregate | Packet Transmit | Packet Receive |
|---|---|---|---|---|---|
| | | | | Actual | Actual |
| 21 | 44.16 Mbps | 14.39 Mbps | 58.56 Mbps, 4755 pps | 11685 (1168 pps) | 35879(3587 pps) |

**Efficiency**

| Downlink | | | Uplink | | |
|---|---|---|---|---|---|
| Efficiency | Fragments count | | Efficiency | Fragments count | |
| | Actual | Expected | | Actual | Expected |
| 99% | 866157 | 862656 | 98% | 284122 | 281208 |

**Currently transmitting at:**
VC 21 Rate 8X/4X MIMO-B

*Illustration 8: 5 GHz Radio link test result*

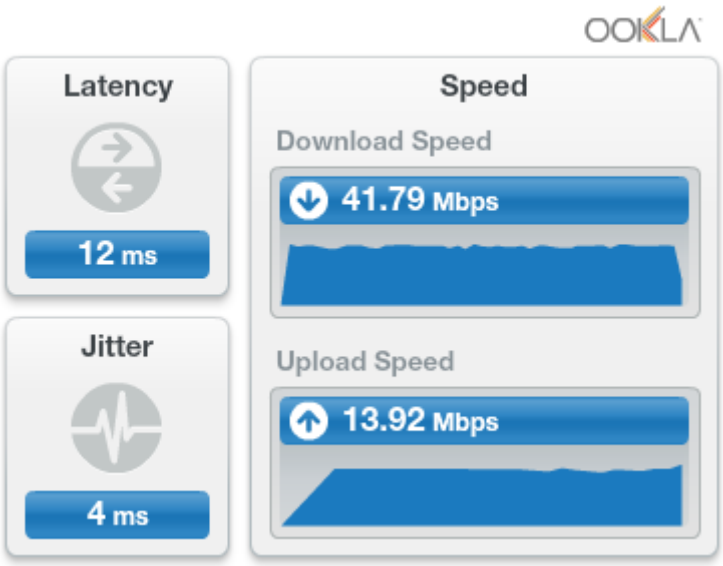


*Illustration 9: 5 GHz speed-test*

# 4. Trial methodology

To have a meaningful and systematic approach to the NGA trial data needed to be collected, it had to be analysed based on the requirements of the NBP, the findings presented and from them conclusions made. A dual approach was decided upon of; a quantitative matrix of sites in the selected area where measurements would be gathered and summarise in a table; as well as a qualitative test to involve existing customers who were upgraded to either 3.6 GHz or 5 GHz SMs free of charge. It was hoped that from the latter tests a 'wow factor' would be created with our customers and an information gained on their understanding of the benefits a significant increase in bandwidth offers.

## 4.1 Performance Results (Quantitative test)

The quantitative tests involved a matrix of 18 sites distributed in bands within the sector footprint at various distances. The field team carrying out the tests were allowed to adjust each location slightly to allow for safety considerations and the suitability of site for radio.

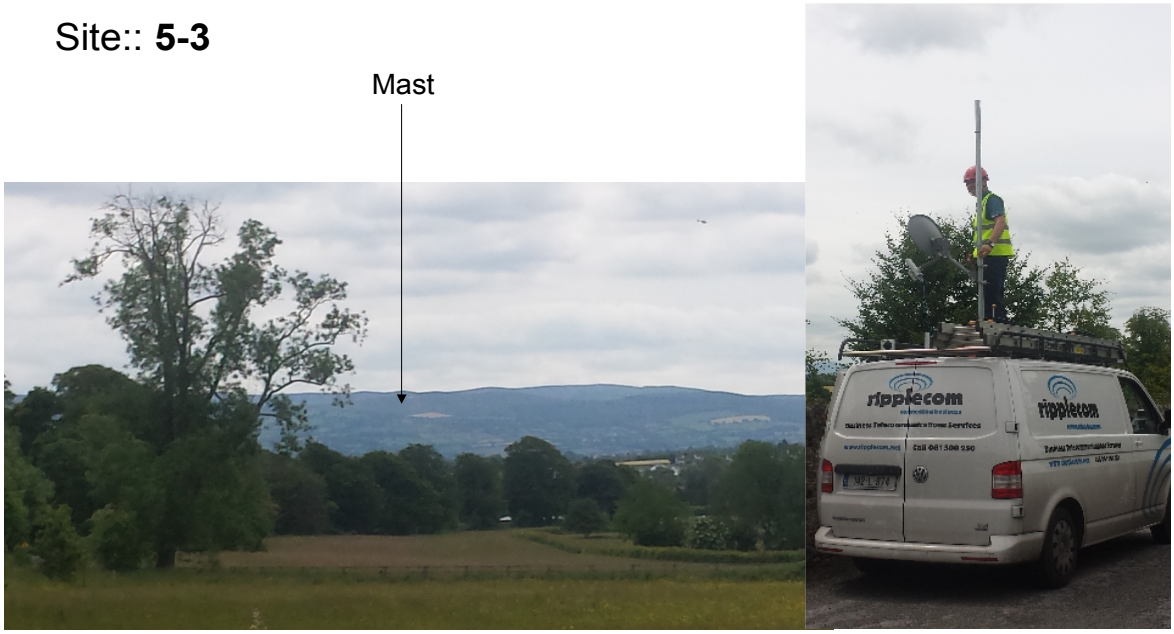


*Illustration 10: Field team carrying out test from site 5.3.*

Illustration 11 shows the actual test points selected by the field teams on the map. These are shown as yellow at 5 Km, red at 10 Km, blue at 15 Km and green at 20 Km.

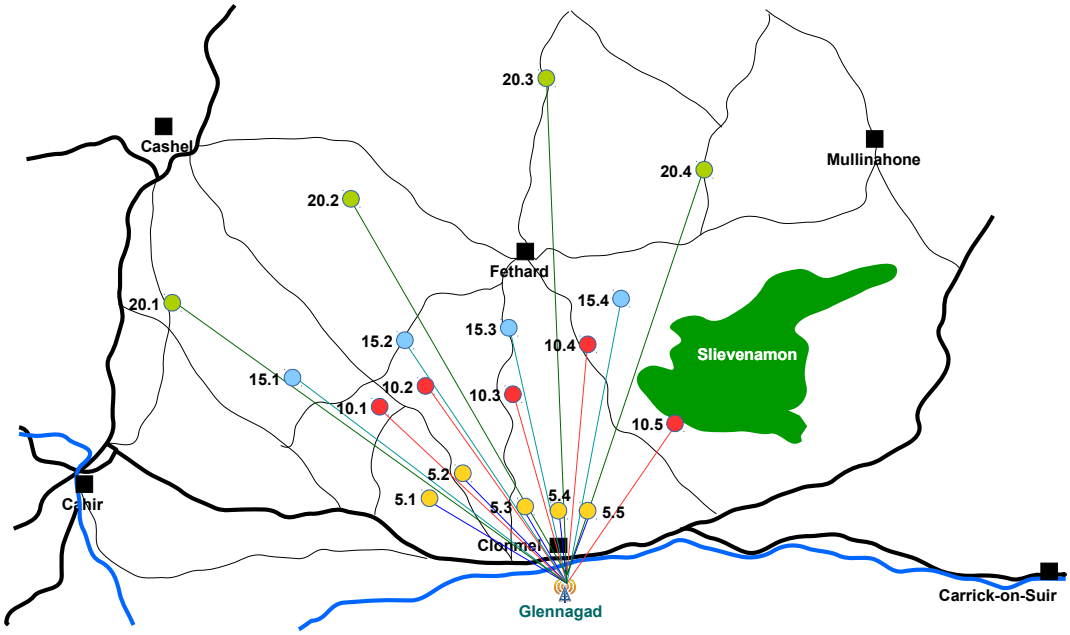


*Illustration 11: Quantitative test*

### 4.1.1 3.6 GHz FWALA

Table 1 outlines the results obtained by the field teams. All except two sites exceeded the Downlink/Uplink test level of 30/10 Mb/s. In fact the average Downlink speed was 62 Mb/s with a corresponding Uplink of 19 Mb/s.

| Site name | Location | DL Status | | | UL Status | Link test | |
|---|---|---|---|---|---|---|---|
| | | Receive Power | | Link Efficiency % | Link Efficiency % | | |
| | | Chain A | Chain B | | | DL | UL |
| 5-1 | 52.37192° -7.74338° | -70 | -75 | 78 | 92 | 22.12 | 14.85 |
| 5-2 | 52.3821° -7.72548° | -60 | -61 | 100 | 100 | 88.41 | 27.83 |
| 5-3 | 52.36914°-7.69965 | -68 | -67 | 99 | 99 | 66.29 | 20.83 |
| 5-4 | 52.36975° -7.67492° | -57 | -57 | 100 | 96 | 88.38 | 26.75 |
| 5-5 | 52.37033° -7.65988° | -75 | -72 | 92 | 98 | 46.21 | 14.07 |
| | | | | | | | |
| 10-1 | 52.41191° -7.77558° | -82 | -82 | 99 | 99 | 22.11 | 6.95 |
| 10-2 | 52.415638° -7.744432° | -61 | -63 | 99 | 100 | 85.96 | 20.86 |
| 10-3 | 52.41744°-7.70283° | -60 | -59 | 100 | 93 | 88.36 | 26.13 |
| 10-4 | 52.43094° -7.65835° | -67 | -69 | 99 | 99 | 66.31 | 20.86 |
| 10-5 | 52.401493° -7.602464° | -71 | -73 | 99 | 99 | 66.23 | 20.76 |
| | | | | | | | |
| 15-1 | 52.42546° -7.83086° | -77 | -79 | 99 | 99 | 43.88 | 13.89 |
| 15-2 | 52.43798° -7.75488° | -64 | -66 | 96 | 99 | 73.75 | 21.06 |
| 15-3 | 52.43680° -7.69973° | -67 | -63 | 96 | 99 | 71.33 | 20.33 |
| 15-4 | 52.44872° -7.63360° | -69 | -72 | 99 | 99 | 66.24 | 20.68 |
| | | | | | | | |
| 20-1 | 52.44263° -7.88204° | -80 | -81 | 98 | 86 | 43.5 | 11.3 |
| 20-2 | 52.48294° -7.79796° | -68 | -71 | 99 | 99 | 66.28 | 20.84 |
| 20-3 | 52.53756° -7.69751° | -75 | -77 | 99 | 99 | 44.2 | 13.93 |
| 20-4 | 52.50307° -7.59455° | -70 | -71 | 99 | 99 | 66.25 | 20.79 |

*Table 1: 3.6 GHz Quantitative results*

### 4.1.2 5 GHz ISM

Table 2 outlines the results obtained for the 5 GHz sites. 2 sites did not meet the 30 Mb/s criteria. The average Downlink speed was 57 Mb/s with a corresponding Uplink average of 16 Mb/s.

| Site name | Location | DL Status | | | UL Status | Link test | |
|---|---|---|---|---|---|---|---|
| | | Receiver Power | | Link Efficiency % | Link Efficiency % | | |
| | | Chain A | Chain B | | | DL | UL |
| 5-1 | 52.37192° -7.74338° | -72 | -72 | 99 | 96 | 67.36 | 15.05 |
| 5-2 | 52.3821° -7.72548° | -72 | -71 | 99 | 91 | 67.28 | 19.39 |
| 5-3 | 52.36914°-7.69965 | -74 | -73 | 97 | 99 | 62.25 | 14.67 |
| 5-4 | 52.36975° -7.67492° | -60 | -62 | 99 | 95 | 78.77 | 21.21 |
| 5-5 | 52.37033° -7.65988° | -70 | -71 | 99 | 96 | 67.36 | 20.84 |
| | | | | | | | |
| 10-1 | 52.41191° -7.77558° | -79 | -79 | 99 | 99 | 44.78 | 7.37 |
| 10-2 | 52.415638° -7.744432° | -70 | -70 | 99 | 99 | 67.48 | 22.02 |
| 10-3 | 52.41744°-7.70283° | -76 | -71 | 99 | 99 | 44.55 | 14.69 |
| 10-4 | 52.43094° -7.65835° | -71 | -72 | 99 | 98 | 67.51 | 21.86 |
| 10-5 | 52.401493° -7.602464° | -74 | -75 | 96 | 99 | 44.74 | 14.7 |
| | | | | | | | |
| 15-1 | 52.42546° -7.83086° | -75 | -76 | 99 | 99 | 45 | 14.69 |
| 15-2 | 52.43798° -7.75488° | -68 | -69 | 99 | 97 | 67.47 | 21.48 |
| 15-3 | 52.43680° -7.69973° | -69 | -67 | 99 | 93 | 67.53 | 20.7 |
| 15-4 | 52.44872° -7.63360° | -72 | -73 | 99 | 99 | 66.72 | 14.72 |
| | | | | | | | |
| 20-1 | 52.44263° -7.88204° | -86 | -87 | 90 | 99 | 20.46 | 3.68 |
| 20-2 | 52.48294° -7.79796° | -75 | -76 | 99 | 99 | 45.05 | 14.67 |
| 20-3 | 52.53756° -7.69751° | -74 | -74 | 95 | 99 | 61.26 | 14.71 |
| 20-4 | 52.50307° -7.59455° | -77 | -78 | 99 | 98 | 45.03 | 14.47 |

*Table 2: 5 GHz Quantitative results*

## 4.2 Qualitative test

A number of customers were approached to participate in the qualitative part of the NDA trial. These customers are shown on the graphic Illustration 12 below.

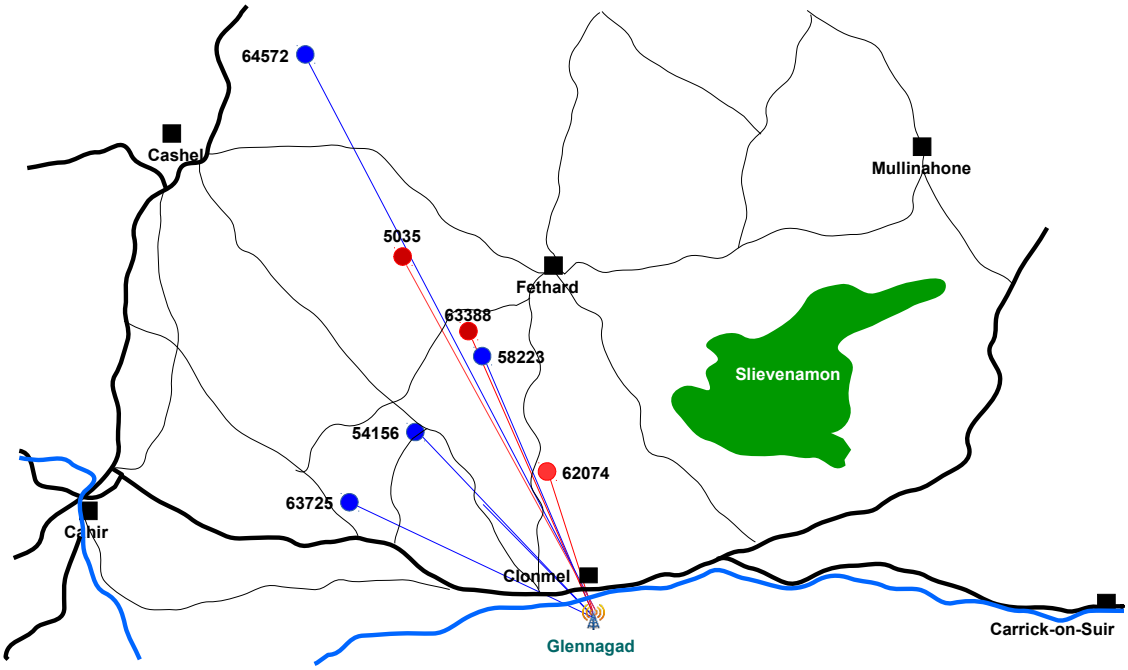


*Illustration 12: Qualitative test*

Each customer received a free installation of a PMP450 SM and were placed in a special trial bucket within the Customer Relationship Management (CRM) system to permit access to the NGA speeds. Depending on the customer's distance from the AP, the SM was installed directly, with a 'lens' or with a 'dish' to increase the Radio Frequency (RF) gain. These options can be seen in Illustration 13.

*Illustration 13: PMP450 SM configurations*

### 4.2.1 Test customer connectivity

Table 3 outlines the connectivity received by the test customers in the trial area. The average Downlink/Uplink received by the 3.6 GHz customers is 62/19 Mb/s while the 5 GHz enjoy 67/16 Mb/s.

| ID | Location | DL Status | | | UL Status | Link test | |
|---|---|---|---|---|---|---|---|
| | | Receive Power | | Link Efficiency % | Link Efficiency % | | |
| | | Chain A | Chain B | | | DL | UL |
| **Clonmel NGA Trial – 5 GHz Customers** | | | | | | | |
| **54156** | 52.4079510°, -7.7613390° | -69 | -71 | 99 | 98 | 66.2 | 20.51 |
| **58223** | 52.4382130°, -7.7208590° | -65 | -65 | 99 | 100 | 65.8 | 20.88 |
| **63725** | 52.3823540°, -7.8056500° | -64 | -62 | 99 | 99 | 65.94 | 20.83 |
| **64572** | 52.5390040°, -7.8290600° | -76 | -74 | 88 | 100 | 50.85 | 13.92 |
| **Clonmel NGA Trial – 5 GHz Customers** | | | | | | | |
| **5035** | 52.4637100°, -7.7636300° | -72 | -72 | 98 | 99 | 66.13 | 14.68 |
| **62074** | 52.3997630°, -7.6972590° | -69 | -68 | 99 | 93 | 67.42 | 20.58 |
| **63388** | 52.4452390°, -7.7256520° | -69 | -71 | 99 | 99 | 67.41 | 14.74 |

*Table 3: Test customer connections*

### 4.2.2 Qualitative follow-up

Each of the qualitative customers were called to gain an understanding of their experience with the higher speed broadband. The customers were given a number of statements and asked to grade from 1 to 5 (1 - Strongly Disagree, 2 - Disagree, 3 - Neither agree or disagree, 4 - Agree, 5 - Strongly Agree) and were given the opportunity to elaborate.

- This trial service excels all my expectations.
- In comparison to my previous product, this product is far superior.
- Now that I have faster speeds I am doing more online.
- If I had these speeds available to me in the future, I would plan to do more online. (e.g. netflix, smart-tv, etc..).

The results of the first survey are compiled in Table 4. While each of these customers are definitely getting far more bandwidth that they were before (by a factor of 4) the results demonstrate a lack of understanding of high speed broadband and the potential benefits among the customer set. This is particularly borne out by the customer who could not see a difference from the old equipment despite their being an actual significant difference. The agent checked the customer usage and she did not use the broadband service much.

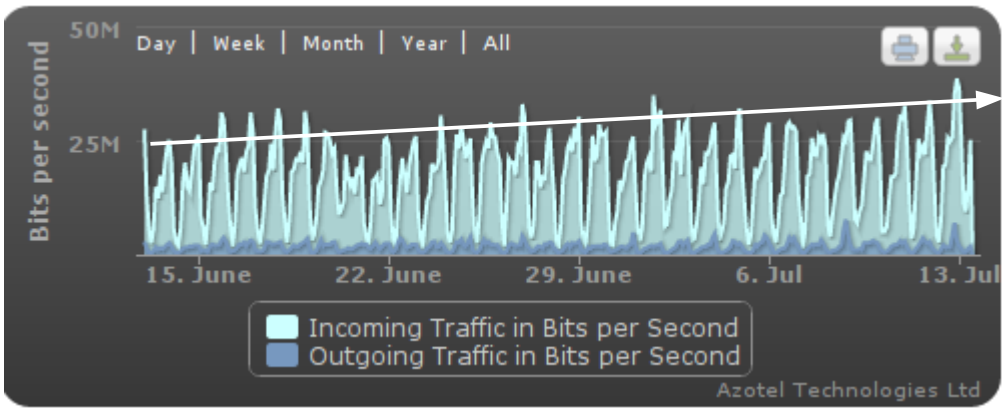


*Illustration 14: Clonmel throughput through trial period*

When comparing the results of the qualitative test results to the actual throughput at the site, a small increase in gradient of .05 over the month with a peak of 35 Mb/s while the available capacity is 100 Mb/s.

This is a similar trend Ripplecom have also seen with customers where we have replaced a Digital Subscriber Line (DSL) service in one of our fibre towns. An assumption that giving the customer a significant bandwidth increase is going to enable greater use is flawed. Without a corresponding demand stimulation the customers do not necessarily appreciate that they in fact have a significantly improved product.

| This trial service excels all my expectations | In comparison to my previous product, this product is far superior. | Now that I have faster speeds, I am doing more online. | If I had these speeds available to me in the future, I would plan to do more online. | Additional Notes |
|---|---|---|---|---|
| 3 | 5 | 3 | 4 | Wouldn't elaborate on any question. No comment. |
| 4 | 5<br>Faster | 4 | 4 | Not very helpful in answering questions and didn't want to elaborate on any statement. |
| 2<br>Wireless adaptor not allowing him to do much he thinks (New one being issued) | 2 | 2 | 4 | Connection good and faster. (good to talk). |
| 2<br>No difference to old equipment | 2 | 2 | 4<br>Use it a bit more | No difference to previous equipment. Agent checked usage and it is not used much. |
| 4 | 4<br>superior not far superior | 3<br>Not really | 2 | Phone and laptops faster but pc not much different/ OAP he said doesn't use it for films etc. |
| 4 | 4 | 4<br>Youtube, RTE player | 4<br>Netflix | More reliable. |

*Table 4: Qualitative results*

# 5. Cambium development

Cambium Networks have demonstrated over the years with their PMP products a level of innovation to maintain a continuous gain in capacity, spectral efficiency and throughput. Illustration 15 demonstrates the history of the product and the next step.

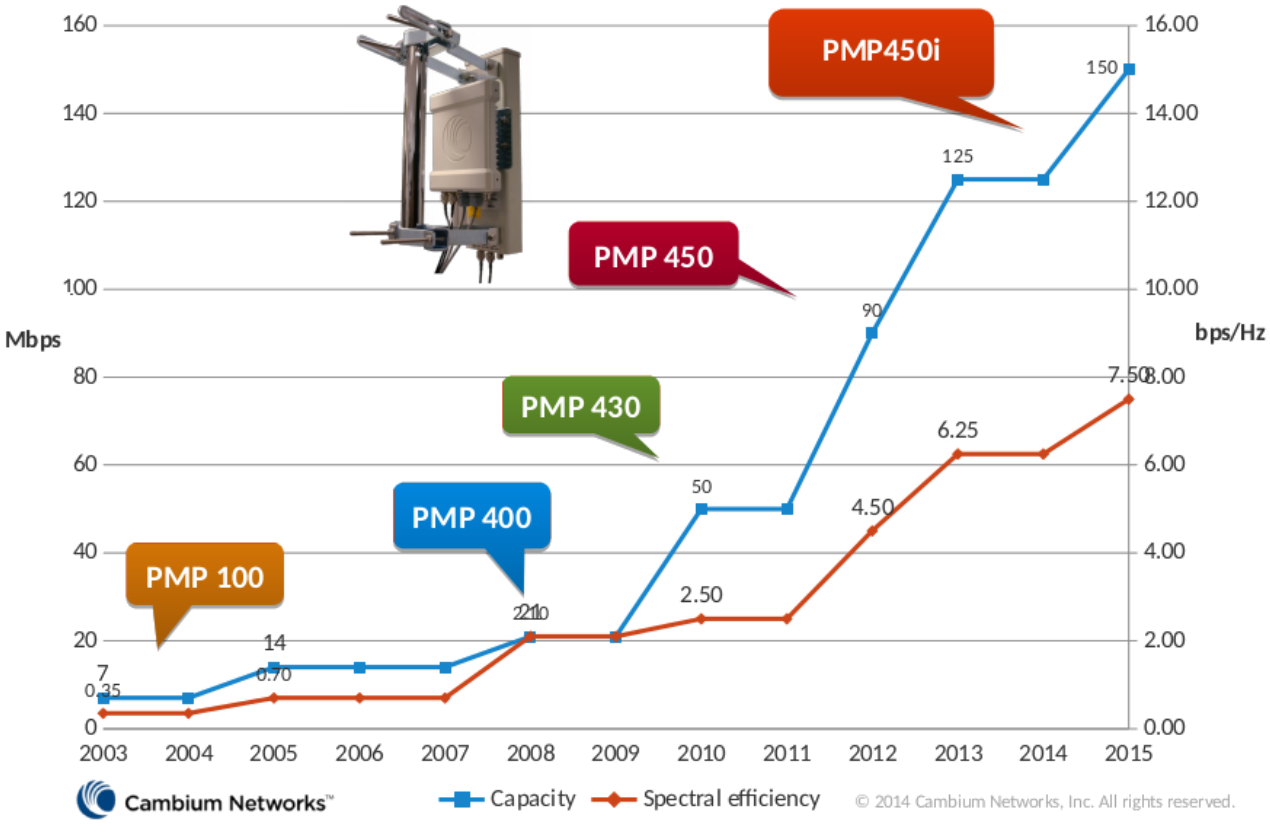


*Illustration 15: Cambium technology evolution: past and present*

The research and development work being carried out by Cambium on Multi-User MIMO (Mu-MIMO), an advanced form of MIMO where the antennas are spread over a multiple independent APs and independent radio terminals with each having multiple antennas. Additionally work on beam-forming technology in association with Mu-MIMO are showing very positive results and will be seen as capacity increases as demonstrated in Illustration 16.

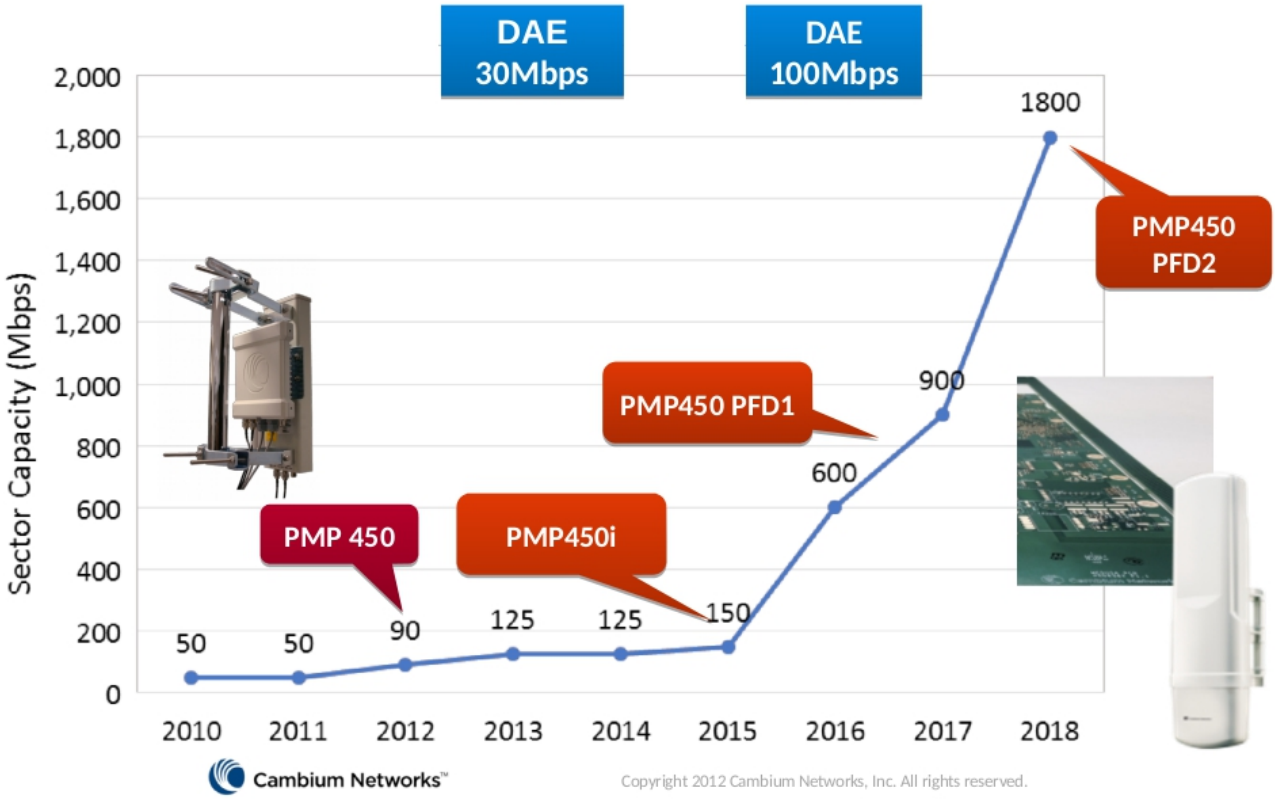


*Illustration 16: Cambium: technology evolution: present and future.*

# 6. Conclusions

The NGA trial conducted by Ripplecom has demonstrated that it is possible to deliver NGA speeds in rural environments using wireless technologies. Radio technology is constantly evolving and considering the roadmap from Cambium Networks the improved features to be delivered in the PMP455 demonstrate that while the PMP450 can deliver the NGA speeds required today as well as those for tomorrow, the progressive changes that are expected beyond the year 2020 will be available in line with technology improvements in the radio equipment.

In these tests the 3.6 GHz FWALA spectrum was under trial license from ComReg. It will be necessary for ComReg to consider renewal and reconfiguration of this band beyond the 2017 deadline. This is essential to ensure continuity of broadband service to customers as well as for the delivery of targets under the NBP.

While the NBP can deliver 'superfast' broadband to households across the state, without a corresponding demand stimulation programme it is not clear that the customers will understand the benefits that can be derived from such a speed increase.

# 7. Table of Abbreviations

| | |
|---|---|
| AP | Access Point |
| CFI | Call for Input |
| CRM | Customer Relationship Management |
| DCENR | Department of Communications, Energy and Natural Resources |
| DL | Downlink |
| FDD | Frequency Division Duplex |
| FWA | Fixed Wireless Access |
| FWALA | Fixed Wireless Access Local Area |
| GHz | Giga Hertz |
| ISM | Industrial, Scientific and Medical |
| ISP | Internet Service Providers |
| Mb/s | Mega bits per second |
| MHz | Mega Hertz |
| MIMO | Multiple-Input and Multiple-Output |
| Mu-MIMO | Multi-User MIMO |
| NBP | National Broadband Plan |
| NGA | Next Generation Access |
| nLOS | near Line of Sight |
| OFDM | Orthogonal Frequency Division Multiplexing |
| PMP | Point to Multi-Point |
| RF | Radio Frequency |
| SM | Subscriber Module |
| UK | United Kingdom of Great Britain and Northern Ireland |
| UL | Uplink |
| WISP | Wireless Internet Service Providers |

# 18 Three Ireland Hutchison Ltd (3IHL)

# Proposed 3.6GHz Award

## Response to Document 15/70 from Three

**28th August 2015**

## Introduction

Three is pleased to respond to ComReg's proposal to award spectrum in the 3.6GHz band. We acknowledge that ComReg has taken into account many of the comments submitted by Three and other respondents as part of consultation 14/101, and has made several modifications to its proposals as a result of them. The most significant of these is the proposal to award 3.6GHz spectrum in a separate process rather than as part of a multi-band award, and Three supports that proposal.

There are also some aspects of the current proposal where Three believes ComReg needs to make amendments. Some of these are new considerations that have emerged as ComReg's proposal has been developed and clarified, and some are issues that have been raised before, where we believe ComReg has not properly taken the response comments into account. Three's view on these issues is provided below in the section-by-section responses.

Overall, we believe ComReg should not be overly prescriptive in its approach to this spectrum or in relation to the licence conditions that will apply. While 3.6GHz is a relatively large 3GPP band and will be included by manufacturers in their LTE roadmaps, its propagation and coverage mean that it will not be used in Ireland in the same way as other mobile bands. In fact it might be used in several different ways depending on the licensee and location, e.g. it might be used for mobile capacity in urban areas and for fixed wireless access or initial stage backhaul in rural areas. ComReg need to allow enough flexibility for these different types of use to emerge.

## Response to Chapter 4 Questions

*Do you agree with ComReg's preliminary views set out in Chapter 4 and, in particular, that:*

> *• the band plan for the 3 400-3 600 MHz sub-band should be TDD (in line with the preference expressed in the 3.6 GHz EC Decision);*

Three agrees with ComReg's proposed band plan (80x5MHz TDD channels). This plan was widely supported in the responses to ComReg document 14/101, and it seems that most interested users would want to use the band in TDD mode only. This means it represents the most efficient duplex arrangement. Three does not agree with the proposal to group channels 3 to 7 into a single lot in the award process though (see further comments below under chapter 5).

> *• regions should be established in line with the principles identified by ComReg;*
>
> *• the regions identified in Option 2 should be used for the proposed award;*

Three agrees with the principles proposed by ComReg to be used in defining the regions for the award process, and supports the regions identified under Option 2, with one proposed modification as explained further below. Three believes the regions should be defined in accordance with the four geographic areas identified by

ComReg, including the borders proposed. Three also agrees that the 5 cities should be separated from the other regions. It is possible that this spectrum will be used in different modes (or for different services) in cities than in more rural areas. The separation of the cities at least allows the possibility for different licensees to obtain the spectrum in the cities than in the rural regions. Three also agrees that the CSO boundaries should be used to define the cities rather than the political boundaries, as this is more reflective of actual population densities, which is the most important factor in determining type of service to be provided.

The amendment Three proposes is that the five cities should be combined together to form a single region for the purpose of creating auction lots. This would leave five regions in total, four large geographical areas plus the five cities. Three's view is that any bidder who is interested in obtaining the spectrum for urban service would want to cover all five cities rather than just one, and this will help to reduce the auction complexity by reducing the overall number of lots.

*• a licence duration of 15 years should apply to the 3.6 GHz band.*

In relation to the licence term, Three has already explained its view that indefinite term or rolling licences promote continuous investment, and we repeat that in this case we believe a 20 year minimum would be appropriate. ComReg should incentivise continuous investment in networks and services, however it would be impossible for a licensee to create a valid business case to invest in updating their network at a time when the end of a licence term is approaching. The use of fixed term licences thus creates a period of "zero investment incentive". The duration of this period might vary, but is likely to be as long as the final five years of a licence. Rolling licences eliminate this period of zero investment incentive.

It is likely that some service providers may plan to use 3.6GHz spectrum to provide fixed wireless access as part of the National Broadband Plan, and a 20 year licence term would seem to be compatible with the commitments that are required in that context. For this reason, Three believes a minimum licence period of 20 years is appropriate.

## Response to Chapter 5 Questions

Three disagrees with several aspects of ComReg's proposals under Chapter 5. In some cases the reason for this disagreement has already been provided to ComReg in response to consultation 14/101, and it is not intended to repeat the arguments in this response, except to provide clarification where necessary.

*Do you agree with ComReg's preliminary views set out in Chapter 5 and, in particular, that:*

*• a combinatorial clock auction is the preferred auction format;*

Overall, Three believes ComReg has proposed an award format using a combinatorial clock auction with high minimum prices in order to mitigate aggregation risks and gaming opportunities. Three believes ComReg has placed too much weight on these considerations, and as a result have determined to use an auction mechanism that is overly complex. This award could be expected to be of interest to a broad range of bidder types, however the complexity of the auction

format itself might place some bidders at a disadvantage. Three believes there is a small likelihood of gaming to reduce prices in this process, and that with a large number of spectrum blocks to be awarded the aggregation risk is not a significant consideration. As a result, we believe ComReg has unnecessarily discounted alternative auction types that could produce an efficient outcome while being significantly less complex. For this reason, Three believes ComReg should review its choice of auction type with a reduced weighting on these factors. In this case either SMRA or SCA would emerge as the preferred auction type.

> *• a single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz;*
>
> *• Sixty five (65) frequency-generic lots of 5 MHz each should be adopted for frequencies between 3475 MHz – 3800 MHz;*

Three does not agree with ComReg's proposal to group channels 3 to 7 into a single frequency block for the award. This is an unnecessary restriction or limitation which would reduce flexibility within the auction. If ComReg is to proceed with a CCA auction, then any issues regarding aggregation of channels (which might arise because these lots are separated from main group by the 8 channels reserved for State Services) can be decided within the assignment round. As an alternative, ComReg should consider whether it would be possible to re-tune the existing user to either end of the band so that 70 contiguous lots are available at auction.

Three is of the view that ComReg should include 70 generic frequency blocks of 5MHz each in the auction process.

> *• a competition cap should be set and, further, that such a cap be within the range of 150 MHz to 250 MHz. ComReg is mindful of the alternative uses to which this spectrum can be put and the potential impacts this can have on competitive dynamics in the relevant market concerned (for example fixed of mobile). Accordingly, ComReg welcomes input on any other factors which should be taken into account when establishing the level of any competition cap;*

In relation to competition caps, Three would caution that ComReg should not take any decision in relation to future award processes. The whole purpose of a cap is to influence or determine certain award outcomes. This involves ComReg taking a position in advance of any auction rather than allowing the auction itself to determine the outcome. Competition caps can prevent the most efficient outcome from emerging in an auction, and should only be implemented in full consideration of the circumstances that exist at the time of a particular award. For this reason, ComReg should take no decision now that could fetter its options in any future award process. Any decision in relation to award caps should be limited to what is necessary for the spectrum to be included in this award process only.

In general, competition caps can be used successfully in circumstances where the use or application of a band is suited for a homogenous group of users only, and in particular where there is no other band available which is a good substitute. In these circumstances, caps can have the effect to ensure a minimum distribution of spectrum in order to protect competition in downstream markets. Outside of these circumstances, the imposition of caps can mean ComReg has picked winners and losers in advance of the auction itself.

In relation to the 3.6GHz band, this spectrum might be under consideration for several different types of use, ranging from mobile to fixed access. The award cap

should be large enough to ensure that no valid application or type of use is eliminated. ComReg should not set the competition cap below the maximum value that would be useful and valuable for each type of use under consideration. On this basis, Three believes the competition cap should not be set below 150MHz or 30 channel blocks in any region.

***Minimum Price***

Three disagrees fundamentally with the approach ComReg has taken to setting the minimum price for this award. In consultation document 14/101, ComReg stated that a minimum price is necessary to prevent bidders from obtaining spectrum below its economic value. Three requested ComReg to clarify what this means, and ComReg has clarified that:

> "*In this context, ComReg considers that the price of spectrum should be reflective of its value for an alternative user, who cannot obtain (any or additional) spectrum due to the limited availability of frequencies. Therefore, by real economic value, ComReg means the highest value that spectrum would have to potential alternative acquirers, if it were not assigned to the user actually acquiring it".*

This raises a basic question as to how this situation could arise in the circumstances where ComReg is to award spectrum by auction. Surely a fair auction will ensure that the bidder who places the highest value on the spectrum will be awarded it. ComReg seems to be attempting to anticipate some potential future change that might radically alter the value of spectrum during the licence term. This is speculative at best, and implies that ComReg would rather see spectrum unsold and unused than have it awarded at what it considers is below the *real economic value*.

A further difficulty with this approach is that the *real economic value* is to be determined by way of benchmark of historical awards rather than the auction itself which is the best determinant of the value of the spectrum at this time. ComReg's approach unnecessarily risks choking demand during the award process, leaving a legitimate interested bidder unable to obtain spectrum. This would be an inefficient outcome, and is contrary to ComReg's statutory objectives.

Three is of the view that ComReg should set a low but non trivial minimum price, designed only to eliminate frivolous bidders.

> • *benchmarking be used as the approach by which to determine a conservative minimum price;*

Subject to Three's comments above regarding the overall approach to minimum price in this case, the use of benchmarking to set the minimum price in this award process, and in particular the approach being taken (to determine a conservative market value) is wholly unreliable and runs a serious risk of choking off valid demand. In the first place, there is no reliable benchmark data available that could indicate the value of this band in Ireland which means there is significant uncertainty as to whether the value produced will be below that of the lowest interested bidder. The minimum price needs to be adjusted downwards by a factor to eliminate this risk.

> • *the minimum price should be apportioned on a 50/50 basis between an up-front payment (SAF) and ongoing annual payments subject to CPI index linking (SUFs); and*

Subject to Three's other comments regarding the minimum fee, the 50/50 split seems appropriate.

> *• the range €0.015 to €0.025 per MHz per capita is appropriate for the setting of the minimum price, with the higher end of the range applying to urban areas and the lower end applying to regions that do not have specific urban areas identified.*

As previously stated, Three disagrees with the approach to setting of a minimum price that has been taken by ComReg. Further, the benchmark is wholly unreliable, and as a result the range proposed above is excessive and risks choking off demand.

> *• the population of each of the regions under Option 2 should be adjusted to take account of the commuter flows between the five identified cities and the other applicable regions. A 7.4 Please provide a detailed explanation of your views, with supporting material, having regard to ComReg's statutory objectives, duties and functions.*

Three does not believe that it is appropriate to adjust spectrum prices to account for commuter flows. This presupposes a particular type of use which would indicate higher value in urban areas. In practice, the 3.6GHz band might be most heavily used to provide fixed wireless access to the commuters in the evening and weekends when they are outside of urban areas. This would imply a higher value per head of population in rural areas.

## Response to Chapter 6 Questions

*A 7.5 Do you agree with ComReg's preliminary views set out in Chapter 6 and, in particular, that:*

> *• the band should be released on a service- and technology-neutral basis;*

Yes, Three agrees that the band should be awarded on a service and technology neutral basis. This must be facilitated by all aspects of the licence terms and conditions.

> *• rights of use in the band should be awarded on a non-exclusive basis;*

While it is acknowledged that other licences are also awarded on a non-exclusive basis, bidders who enter an auction and pay for the right to use spectrum expect to be able to do so free from interference and without unnecessary encumbrance. Other use would need to be on a non-protected non-interference basis, and some degree of certainty in this regard would be required before any alternative licences were granted in the same spectrum.

> *• an obligation to notify of the termination of a technology should apply;*

Yes, Three agrees with this requirement.

> *• a rollout obligation should apply for spectrum rights of use in this band and that such an obligation should be based on a minimum number of base stations to be deployed per sub-national region;*

Three believes ComReg has approached the 3.6GHz licence obligations in a similar way to that which would have applied to core mobile bands like 900MHz. Three believes this is an incorrect approach for the 3.6GHz band particularly given the mixed use that may emerge. In order to ensure the licences are technology and service neutral, some amendments will be required.

ComReg should only impose the minimum obligation to ensure that spectrum is used by each licensee. At its simplest, this is a requirement that each licensee brings their licensed spectrum into use. It is not appropriate to specify the number of base stations per region, as this might eliminate some valid use types.

> *• a quality of service obligation should apply in relation to each of network availability and voice call standards;*

Again, this type of obligation is more appropriate to a core mobile band, and is not appropriate to mixed use or service and technology neutrality.

> *• licensees should internalise guard-bands as spectrum should be assigned without guard-bands;*

Yes, Three agrees with this requirement.

> *• a default TDD frame-structure based on TD-LTE configuration 2 (3:1) should be applied to incentivise inter-network synchronisation;*

No, Three does not agree that ComReg should specify a TDD frame structure. This is incompatible with a service and technology neutral licence, and could prevent some legitimate use types.

> *• a permissive BEM should apply to synchronised networks and a restrictive BEM should apply to unsynchronised networks;*

Yes, Three agrees with this proposal.

> *• the terminal station in block power limit set out in the 3.6 GHz EC Decision should be relaxed for fixed outdoor installations;*

Yes, Three agrees with this proposal.

> *• at regional borders a coordination threshold should apply to allow for bilateral/multilateral co-existence agreements;*

Yes, Three agrees with this proposal.

> *• where agreement in cross-border coordination fails to be met, the coordination threshold limit should be set as a binding licence condition.*

Yes, Three agrees with this proposal.

## Response to Chapter 7 Questions

*A 7.7 Do you agree with ComReg's preliminary views set out in Chapter 7 and, in particular, with the following proposals:*

> *• Transition Proposal 1: the formulation of a transition plan for the 3.6 GHz band;*

ComReg should formulate a transition plan for the band, however we would make the following observations:

- The outcome of the award process is unknown and difficult to anticipate, and obviously it will be easier to develop a transition plan after the award is complete. The two transitions that followed the 2012 MBSA have shown that

licensees can cooperate and act in good faith. While safeguards and obligations will be required, ComReg should not try to overburden the process of transition planning in advance of the award, as this will be much simpler afterwards.

- For the transitions which followed the 2012 MBSA, the same licensees held spectrum before and after transition, and were capable of maintaining continuity of service. That might not occur in this case.

• *Transition Proposal 2: the Transition Protected Licence;*

Yes, Three supports this proposal.

• *Transition Proposal 3: the Transition Unprotected Licence.*

While Three sees some merit in this proposal, a 5-year term is excessive. The maximum permitted should be 2 years and must be on a non-interference unprotected basis.

End.

# 19 Viatel

# Response to Consultation 15/70

## ComReg

3.6 GHz spectrum award

August 2015

*Do you agree with ComReg's preliminary views set out in Chapter 4 and, in particular, that:*

## 1 / The band plan for the 3 400-3 600 MHz sub-band should be TDD (in line with the preference expressed in the 3.6 GHz EC Decision);

As mentioned in our previous submission, Viatel agrees that the 3400 – 3600 MHz band plan should be TDD in line with the preference expressed in the 3.6 GHz EC Decision. However, this decision also mentions that "*members states may alternatively implement Frequency Division Duplex (FDD) mode of operation in the 3 400 – 3 600 MHz sub-band for the purpose of […] (b) protecting existing uses […]*". Given one respondent expressed interest for FDD deployment and that the existing usage is widespread on FDD, it may be appropriate to keep a portion of the band available to FDD or TDD. Viatel would suggest the 5 x 5 MHz FDD channels in the range 3 410 – 3435 MHz / 3510 – 3535 MHz. It is interesting to note that the latest 3.6 GHz auction which took place in EU (Slovakia, 2015) did allow for such flexibility. We believe there is sufficient spectrum available to accommodate most of the needs of the marketplace, even though it does mean losing a bit of spectrum by setting additional guard bands. We also would like to see ComReg questioning further the effective usage of the band 3435 – 3475 MHz by the State services. A transition plan could be set out similarly to the FWALA band.

## 2 / Regions should be established in line with the principles identified by ComReg

Viatel broadly agrees with the principles set out by ComReg. We'd like to add one element as regards of the delimitation of the urban region boundaries. It would be useful to include key elevated rural areas around each urban region allowing operators to make use of key transmitter areas such as ThreeRock near Dublin or Woodcock Hill near Limerick. Similarly to the FWALA scheme, a urban licence could be set out with an appropriately sized radius. ComReg should be able to ascertain which high sites are strategic through its PTP Licence database. Alternatively, Viatel is happy to detail its suggestions. It may also be still pertinent to include an interference contour zone.

## 3 / The regions identified in Option 2 should be used for the proposed award; and

At first look the regions identified in Option 2 seem coherent. However, using the administrative boundaries does again ignore in many ways the topography of the area, and will limit wireless deployment in certain zones. For example, Viatel's best high site to cover Carlow town is located around the Rossmore Hill, Co Laois, which is located in another rural region. As it is currently laid out, Carlow town urban area will be split between two rural regions making any future comprehensive roll-out difficult to proceed with. We therefore suggest incorporating Laois County into the Wexford-Carlow-Kilkenny-South Tipperary-Waterford region. This should not provoke any great imbalance between regions. In order to resolve any further specific issues, the licence conditions should be allow sub-leases on specific set of electoral divisions in order to resolve any further issues coming from the using of the county boundaries.

## 4 / A licence duration of 15 years should apply to the 3.6GHz band

As previously stated, Viatel agrees with a licence duration of 15 years. As an effort to take in account feedback received, ComReg may agree to incorporate a 5 years extension post the initial licence term pending the Authority has no material requirement to reclaim the spectrum.

## 5 / a combinatorial clock auction is the preferred auction format

Viatel agrees that a combinatorial clock auction is the preferred auction format. Viatel has notably used this system in the UK for the assignment of its 10 GHz national licence. Our experience is very positive so we'd support ComReg in its choice.

## 6 / a single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz;

As stated in our answer n˚1, we first of all would like to have a better understanding of the effective use by the State of the 3 435 – 3 475 MHz band. ComReg is fully entitled to set a cease date of the FWALA scheme and it should be the same situation regarding to this band. More information should be available on the level of usage and its trending overtime, and may allow considering one full contiguous band. Should it be confirmed that the need of the States services band is imperative post 2017 – Viatel does agree that a single 25 MHz frequency-specific lot appears to be the easiest solution to avoid a situation where a bidder would be awarded two non contiguous lots.

## 7 / Sixty five (65) frequency-generic lots of 5 MHz each should be adopted for frequencies between 3475 MHz – 3800 MHz;

We agree with ComReg's proposal. This lay-out associated with the CCA auction system should indeed allow for maximum flexibility for spectrum allocation while reducing complexity.

## 8 / a competition cap should be set and, further, that such a cap be within the range of 150 MHz to 250 MHz [...].

Viatel agrees with DotEcon's 150 MHz cap proposal. This has the critical advantage of sufficient enough room for competition by leaving enough spectrum to deploy three separate networks. That requirement is very important especially when you consider the lessons learned from the previous FWALA schemes, from which the Viatel group was a very active player. No appropriate capping methodology has been set out meaning that one single operator currently controls most of the 3.5 GHz capacity in Dublin area, which did de facto limit competition in this strategic market. We consider setting a cap to allow for 3 operators is an absolute minimum requirement; we therefore recommend a cap of 150 MHz and a monitoring of M&A activity in order to prevent the emergence of a near monopoly.

## 9 / benchmarking be used as the approach by which to determine a conservative minimum price;

Viatel believe it is more appropriate to complete a benchmark with European awards excluding outliers as suggested by DotEcon. We therefore believe setting a maximum price of €0.0064 is pertinent. This comparison pool is the most relevant as its compares country with broadly the same underlying telecom infrastructure. As such, you may find higher price per MHz per Capital in developing countries where fixed networks are not covering the full territory therefore making any benchmarking not applicable. We disagree with the idea that previous valuation may have been undervalued compared to now. In contrary, one could assume that abnormal valuation did actually prevail due to the excessive expectations made by the market toward the WiMax technology from 2005. It is also important to note that further 3.5/3.6 GHz auctions/transactions did occur in Europe which are not listed in the DotEcon report. This may also bring

into question the validity of the conclusions. For example, Free Telecom bought a 3.5 GHz national licence in France from Altitude Telecom in 2005 for a value of €57m[1]. In 2006, still in France, two more 15 MHz FDD were allocated per region for a total proceeds of €126m[2]. Closer to us, the Belgian BIPT has issued a 10 years 3.5 GHz national licence in March 2015, raising a single minor interest due to setting an excessive fee structure. A process is also currently undergoing in Romania and the Moldovan recently failed to find interest on 3.5 / 3.7 GHz bands[3]. We are therefore questioning the representativeness/completeness of the DotEcon benchmark list including dated and recent auctions. A more detailed benchmark should be possible.

### 10 / the minimum price should be apportioned on a 50/50 basis between an up-front payment (SAF) and ongoing annual payments subject to CPI index linking (SUFs)

Could you please detail using one example the exact workings used for the SUF calculation? Using the "Galway city & Suburbs" SUF price from Table 2 as an illustration, this licence would be worth €12k including €6k payable upfront. We suppose the remaining €6k would be due over a period of 15 years. If you simply divide this value by 15, you find a figure of €400. However, DotEcon's NPV formula makes us achieve an annual fee of €620 (+55%) before you even think about CPI. We have tried to recalculate the SUF without success using the 8.63% discount rate and a 15 years duration. Could ComReg issue a detailed example of the calculation? We strongly question whether the mobile operators' discount rate is applicable for a band suitable for fixed based solutions. Based on ComReg/DotEcon calculations, it is clearly in the operators best interests to reduce the share of ongoing annual payments.

### 11 / the range €0.015 to €0.025 per MHz per capita is appropriate for the setting of the minimum price, with the higher end of the range applying to urban areas and the lower end applying to regions that do not have specific urban areas identified.

Please see our response 9. We believe a maximum fee of €0.0064 should be used across all regions. An operator wishing to offer a wireless broadband solution based on TD-LTE in Dublin will face much higher competition from fibre/cable based solutions. Therefore, its business model may not necessarily improve to the level that would explain an increase of 67% of ComReg fees. We advise ComReg to complete the benchmark analysis, taking in account in priority developed economies with similar population densities. Review should also be made from failed case studies which often highlight factors such as excessive reserve price.

### 12 / the population of each of the regions under Option 2 should be adjusted to take account of the commuter flows between the five identified cities and the other applicable regions.

Taking in account commuter flows could be pertinent if you assume the principal use will be nomadic/mobile. However, it would appear that a large panel of operators identified fixed based LTE solution as the biggest opportunity. We would therefore assume such solution would be home-based. By such, we don't believe it is applicable to take in account commuter flow should the spectrum band be primarily used at fixed location, and therefore solely in households.

[1] http://arantxa.ii.uam.es/~ferreiro/sistel2008/anexos/WIMAX%20regulation.pdf
[2] http://www.muniwireless.com/2008/10/29/france-wimax-deployments-severe-delays/
[3] http://www.analysysmason.com/Research/Content/Newsletters/Spectrum-Newsletter-May2015-RDTS0/

**13 / the band should be released on a service- and technology-neutral basis;**

Agreed.

**14 / rights of use in the band should be awarded on a non-exclusive basis;.**

Raising the question is somewhat useless if the binding 3.6 GHz EC decision specifically states that the band should be released on such terms. The conditions set out in S.I 251 of 2012 are acceptable.

**15 / an obligation to notify of the termination of a technology should apply;**

The conditions set out in S.I 251 of 2012 are acceptable.

**16 / a rollout obligation should apply for spectrum rights of use in this band and that such an obligation should be based on a minimum number of base stations to be deployed per sub-national region;**

First of all, we don't believe it is pertinent to consider the current total number of BS rolled per region under the FWALA scheme in order to form a view on the minimum number of BS to be deployed per region under the future scheme. The Viatel Group has for example been able to maintain a large customer base in Dublin with just a fraction of the minimum base stations figure suggested by ComReg. Looking at the proposed figures from other regions, we believe them to be sensible. We would however request ComReg to set-up several stages in order to meet this roll-out conditions.

**17 / a quality of service obligation should apply in relation to each of network availability and voice call standards;**

Viatel has no comment to make at this time.

**18 / licensees should internalise guard-bands as spectrum should be assigned without guard-bands;**

Viatel has no comment to make at this time.

**19 / a default TDD frame-structure based on TD-LTE configuration 2 (3:1) should be applied to incentivise inter-network synchronisation;**

Viatel has no comment to make at this time.

**20 / a permissive BEM should apply to synchronised networks and a restrictive BEM should apply to unsynchronised networks;**

Viatel has no comment to make at this time.

**21 / the terminal station in block power limit set out in the 3.6 GHz EC Decision should be relaxed for fixed outdoor installations;.**

Viatel has no comment to make at this time.

**22 / at regional borders a coordination threshold should apply to allow for bilateral/multilateral co-existence agreements;**

Viatel has no comment to make at this time.

**23 / where agreement in cross-border coordination fails to be met, the coordination threshold limit should be set as a binding licence condition.**

Sub-leasing of portion of regions should be made available. For example, the operator holding the North-East region under Option 2 may find an issue to cover the north-western tip of Cavan. It may be on everybody's best interest to amend the region boundaries at ED level in order to take account of local conditions (position of elevated transmitter, town split between two regions).

**24 / Do you agree with ComReg's preliminary views set out in Chapter 7 and, in particular, with the following proposals:**

- **Transition Proposal 1: the formulation of a transition plan for the 3.6 GHz band;**
- **Transition Proposal 2: the Transition Protected Licence; and**
- **Transition Proposal 3: the Transition Unprotected Licence.**

Viatel has no comment to make at this time.

# 20 Vodafone

# Vodafone response to Comreg Consultation 15/70 :

# Proposed 3.6 GHz Band Spectrum Award

# Consultation on Proposed 3.6 GHz Band Spectrum Award

**Document No:** ComReg 15/70

**Date:** 10 July 2015

## General Remarks.

Vodafone welcome the opportunity to comment on ComReg's Consultation on a proposed 3.6GHz Spectrum Award.

Efficient allocation and assignment of spectrum is of critical importance to the delivery of telecommunications services to customers in Ireland. While the proposed auction of 3.6GHz is welcome this band is only one of the bands proposed for auction in ComReg's consultation 14/101. Whereas Vodafone appreciate the urgency of this particular band, in order for Vodafone to efficiently and effectively deliver services to customers we need to develop long term technical strategy and have a clear view from ComReg of future spectrum assignments. To do this it is necessary for ComReg to publish a Spectrum Strategy and a program of future activity of reviewing assignments and planning future auctions. This Spectrum Strategy is considerably overdue. ComReg have not yet commented on the spectrum commitments given as part of the sale of Telefonica Ireland to Hutchinson Ireland last year and any concerns they may or may not have on current spectrum assignments which are radically different from the assignments and associated caps which were the focus of the MBSA in 2012.

Publication of this Spectrum Strategy and Program must happen before further steps are taken in proceeding to auction the 3.6GHz spectrum. While we have stated previously that the primary use for the 3.6GHz band is non-mobile applications, in the absence of a spectrum strategy and a roadmap for the other mobile bands (2.6, 2.3, 1.4, 0.7 GHz) the value of the 3.6GHz band will be artificially raised as operators cannot plan on when the other bands become available.

Similarly Comreg assert in this consultation that spectrum caps for this band can be assessed without any regard to current mobile assignments. This claim would only be valid if a review of the spectrum allocation to mobile operators was completed and a roadmap produced for auctions of the other bands. Otherwise there is a risk that mobile operators will try and fix issues with allocations in lower band by bidding for 3.6GHz spectrum.

Our prime issue with ComReg's document is the proposed minimum cost. As we discuss in detail in the text below we consider the reserve point to be at least double where it should be. We urge Comreg to change this before proceeding to Auction.

In the following text we respond to specific questions in the consultation:

# Consultation Questions

A7.1 Chapter 4 Consultation Questions

A 7.1 Do you agree with ComReg's preliminary views set out in Chapter 4 and, in particular, that:

- the band plan for the 3 400-3 600 MHz sub-band should be TDD (in line with the preference expressed in the 3.6 GHz EC Decision);

**Yes - Vodafone agree with the proposal to use TDD, this gives most flexibility in breaking up the band**

- regions should be established in line with the principles identified by ComReg

**Dividing the country into Regions is a reasonable approach. The design of the split must align with the regional split used in National Broadband Plan.**

- the regions identified in Option 2 should be used for the proposed award; and

**The design of the split must align with the regional split used in National Broadband Plan. It is reasonable to define cities as separate regions as the spectrum may be used for different applications in these regions.**

- a licence duration of 15 years should apply to the 3.6 GHz band.

**Duration should align with NBP – 20 years**

## A7.2 Chapter 5 Consultation Questions

A 7.3 Do you agree with ComReg's preliminary views set out in Chapter 5 and, in particular, that:

- a combinatorial clock auction is the preferred auction format;

## Auctions

Vodafone agree that an auction process is the most appropriate mechanism to award rights of use for spectrum. A well designed auction should provide a transparent process in which the winners are incentivised to build and operate services in order to earn a return on investment. This provides the best outcome for consumers.

An overly complex auction design risks highly unpredictable outcomes that can have significant affects in stifling investment by operators or leaving spectrum unused.

As we stated in our response to Comreg Consultation 14/101, consumers are using increasing amounts of data and more spectrum is required to satisfy their needs. ARPUs are not increasing proportionally. Therefore, as spectrum volumes increase, the value of the additional spectrum will be reduced.

The uncertainty in the timing of the availability of capacity bands and the terminal support adds to this uncertainty.

Competitive Price Setting

This risk was not mentioned by Comreg in 14/101. Vodafone's experience in other countries is that as operators become ever more experienced with CCAs, they do more and more competitive price-setting, driving up the cost of spectrum. This is especially a risk with weak spectrum caps. We believe that this had a significant affect in auctions that took place in Netherlands and Austria.

Complexity

The previous MBSA auction that took place in Ireland was extremely complex. We understand that much of the complexity was due to the two Time Slots and the Liberalised / Non- Liberalised structure of choices. In practice it was not possible for bidders to take part in the auction without acquiring required specific expertise in the working of the CCA format.

## Vodafone's preferred Auction Format.

Vodafone's preferred auction methods are to use either a CCA or SMRA, provided the rules are fair, not too contrived, and the reserve prices and spectrum caps are reasonable. Artificially high reserve prices and no (or weak) spectrum caps would create problems for these auction formats.

Our first preference is to use an SMRA, partly for the greater transparency and certainty about what bidders are going to win, but also because they create less risk of "price setting" behavior by incumbents against each other. As operators have become ever more experienced with CCAs, they do more competitive price-setting, and the results get more and more expensive. This is especially a risk with weak spectrum caps.

Whichever format is used we are keen that the auction is less complex than the previous MBSA. If ComReg decide on using a CCA again, we would encourage them to keep to a more standard design.

- a single 25 MHz frequency-specific lot be adopted for frequency 3410 MHz – 3435 MHz;

This is a reasonable approach as otherwise a segment of spectrum could end up stranded. It will unfortunately make the auction more complex. We are not clear how this effects the assignment round.

- Sixty five (65) frequency-generic lots of 5 MHz each should be adopted for frequencies between 3475 MHz – 3800 MHz

Agreed

- a competition cap should be set and, further, that such a cap be within the range of 150 MHz to 250 MHz. ComReg is mindful of the alternative uses to which this spectrum can be put and the potential impacts this can have on competitive dynamics in the relevant market concerned (for example fixed of mobile). Accordingly, ComReg welcomes input on any other factors which should be taken into account when establishing the level of any competition cap

Vodafone do not agree with ComReg's assertion that spectrum caps for this band can be assessed separately to mobile assignments. This claim would only be valid if a review of the spectrum allocation to mobile operators was completed as there is a risk that mobile operators will try and fix issues with allocations in lower band spectrum by bidding for 3.6GHz spectrum. In Vodafone's view the issue is not just whether spectrum assignments and holdings in complementary bands should be considered in designing competition caps; the overall spectrum holdings of potential bidders should be considered. As there is uncertainty in terms of future spectrum releases potential bidders may select bands available in the short term to satisfy spectrum needs which may have the effect of artificially inflating demand for this band above what would be expected if assignments in the market had been allocated via spectrum auctions. There is also the potential, specifically linked to our earlier point on the use of CCA that holders of significant assignments of spectrum would bid strategically to raise the price for other bidders without the intention of securing spectrum.

- benchmarking be used as the approach by which to determine a conservative minimum price

See text below on 3.6GHz reserve prices.

- the minimum price should be apportioned on a 50/50 basis between an up-front payment (SAF) and ongoing annual payments subject to CPI index linking (SUFs); and

Agreed

- the range €0.015 to €0.025 per MHz per capita is appropriate for the setting of the minimum price, with the higher end of the range applying to urban areas and the lower end applying to regions that do not have specific urban areas identified

## 3.6GHz band reserve prices

Vodafone are strongly of the view that the reserve prices indicated by Comreg in this consultation are excessive. This spectrum will be required to support broadband services in rural areas. In order to maximize use of this band and hence support the government objectives of supplying services to these areas at minimum cost it is imperative that this spectrum is effectively utilized.

While we agree that the 3.6GHz band could accommodate a variety of possible uses, including fixed wireless applications, nomadic wireless services, and possibly some additional capacity for existing mobile operators, the propagation characteristics of the 3.6GHz band will ensure that this band is used principally for FWA type services and the consideration of a suitable price for the band should be driven by this usage rather than by comparison with other frequency bands capable of supporting wide area mobile coverage.

There is a risk that Comreg will artificially distort prices upwards by not publishing a program of auctions for true mobile spectrum that we expected to be auctioned in the near future, the 2.6, 2.3, and 1.4 GHz band and the 700MHz band. It is very important that in advance of a 3.6GHz auction Comreg should publish a clear schedule for these other auctions - otherwise they will artificially create a spectrum shortage.

Given the low potential of the 3.6GHz band to support a wide-area mass-market mobile network we believe that Comreg have chosen an excessively high minimum value – this is likely to lead to unassigned spectrum even though there might be demand for it.

We would proposed that the minimum cost is too high by a factor of about two, a more realistic price would be €0.007 to €0.015

We have broken the arguments against the price selected by Comreg in to a number of sections and analysed ComReg's arguments against these headings.

- **Technology**
- **Propagation**
- **Timing of benchmarked awards**
- **Non-European benchmarks**
- **Comparison with FWA**
- **NBP**

## Technology

We believe that Comreg have erred in comparing the value of this band closely to the 2.6 and 2.3GHz bands. Comreg attempt to justify this comparison by identifying that LTE technology will be available in the 3.6 band. This is a key error. Although LTE will be used in the 3.6 GHz band the propagation characteristics of this band will not support the implementation of wide-area mobile coverage. The benchmark value of 2.6/2.3Ghz would only be a reasonable indicator of the value of 3.6GHz if they can offer similar services. The uses of the 3.6GHz band will in practice compare most closely to FWA products, and comparison should be made to the other bands used for FWA which typically have lower value than bands used for mobile.

We agree that the use of this band will likely to be TDD. Comreg acknowledge that the WiMAX networks that potentially move to LTE will use this band for fixed wireless applications but fail to add the conclusion that the value comparators should be against other FWA spectrum and not against mobile networks.

The use of the LTE air-interface will not materially increase the value of the band - these operators are still offering services that compare most closely to fixed services.

Using a set of benchmarks against 2.6GHz is therefore faulty - as the service being provided by mobile operators is significantly different to FWA type services. For mobile operators the costs of providing wide-area coverage (for instance on roads) are considerable, and mobile operators expect to charge a premium to cover these costs. These higher costs and higher revenue are not available to an operator in the 3.6GHz band – irrespective of the technology being used.

## Propagation

The analysis carried out in ComReg's document does not adequately recognize the effect of differing propagation in lowering the relative value of 3.6GH spectrum when compared to 2.3 and 2.6 GHz spectrum.

The experience of auctions in Ireland, and that in other countries, point to the value of spectrum being very heavily driven by these propagation characteristics of the band being auctioned

In the recent MBSA auction the value of 800MHz and 900MHz spectrum was double that of the 1800 MHz spectrum (both in reserve price and auction result). This fairly reflected the different value of these two bands to operators.

Similarly, for propagation reasons alone, we would expect the value of 2.6GHz spectrum to be double that of 3.6GHz spectrum. ComReg's analysis does not adequately reflect this difference in value.

## FWA comparison

Comreg's attempt to compare the current cost of FWA licences with their proposed Reserve price and conclude that they are similar if applied to a nationwide licence.

This analysis is completely incorrect.

The analysis compares the nominal FWALA licence radius of 20km with the total state area.

This is not useful comparison. In practice FWALA operators 'cherrypick' locations that have both good coverage and a high target population. They could not economically replicate these sites to provide 100% coverage at these licence fees given the wide variety of population densities in the state.

It is also significant that the numbers of FWA customers is very low and declining. Clearly it is not economic to provide a nationwide service at the current licence fees.

## Alignment with the NBP.

More consideration should be give the Governments desire to implement the National Broadband Plan.

Based on ComReg's proposals it would cost almost € 6m for a nationwide 50MHz licence. This is a very significant cost in the context of providing services to areas with low densities of customers, e.g. the most remote 5% of customers discussed in the latest DCENR consultation documents.

An excessive price for spectrum will distort the choice between wireless and wired solution to serve these customers.

## Available international benchmarks

The benchmarks chosen by Comreg include a number of benchmarks from outside Europe. These values may not give a fair indication of spectrum values of spectrum in European countries. In markets outside Europe poor availability or high price of fixed lines can contribute to high values of spectrum capable of providing an alternative service. Benchmarks from these countries are not comparable without analysis of the total telecommunications market in these countries.

## Regionalisation of reserve prices

The regions marked in ComReg's document currently do not align with the draft in Dept of Communications consultation. Clearly the regions used in the licence process must align with whatever process is used in the NBP tender processes.

Excluding the major cities seems to be the best option as the application and use of the spectrum in these areas is likely to be different

## Differences in the value per capita across regions

In ComReg's valuation process they expect urban regions to command a higher spectrum price than other regions and have applied an uplift to the price for licences in urban regions relative to non-urban areas - a similar 'downlift' should be applied for rural areas

## Adjusting for population flows

The process proposed by Comreg for adjusting urban and rural spectrum value is overly complex and unnecessary. If there is different value then auction outcome should determine this.

The benchmarks from other countries have not been adjusted to reflect different demographics in Irelands, and we should not try then to make adjustments within the country.

- the population of each of the regions under Option 2 should be adjusted to take account of the commuter flows between the five identified cities and the other applicable regions

This seems like an overly complex approach. The auction should find any difference in values.

A7.3 Chapter 6 Consultation Questions

- A 7.5 Do you agree with ComReg's preliminary views set out in Chapter 6 and, in particular, that:

agreed

- rights of use in the band should be awarded on a non-exclusive basis;

agreed

- an obligation to notify of the termination of a technology should apply

agreed

- a rollout obligation should apply for spectrum rights of use in this band and that such an obligation should be based on a minimum number of base stations to be deployed per sub-national region;

agreed - this should be set at a low number.

- a quality of service obligation should apply in relation to each of network availability and voice call standards;

agreed

- licensees should internalise guard-bands as spectrum should be assigned without guard-bands;

agreed

- a default TDD frame-structure based on TD-LTE configuration 2 (3:1) should be applied to incentivize inter-network synchronisation;

agreed

- a permissive BEM should apply to synchronised networks and a restrictive BEM should apply to unsynchronised networks;

agreed

- the terminal station in block power limit set out in the 3.6 GHz EC Decision should be relaxed for fixed outdoor installations

agreed

- at regional borders a coordination threshold should apply to allow for bilateral/multilateral co-existence agreements; and

agreed

- where agreement in cross-border coordination fails to be met, the coordination threshold limit should be set as a binding licence condition.

agreed

### A7.4 Chapter 7 Consultation Question

- A 7.7 Do you agree with ComReg's preliminary views set out in Chapter 7 and, in particular, with the following proposals:

## Transition Plan.

**Principles:**

It is Vodafone's view that the assignment of 3.6GHz spectrum in the period after 1 Aug 2017 should be decided by the auction process. The use of auctions to assign spectrum is justified by ComReg's position that the auction process gives a result that most efficiently uses this resource.

In order to achieve a smooth transition of assignments Comreg should ensure that the auction happens in time to allow for all transition activities to happen before the Effective date of the new licences (1Aug 2017).

As identified in the consultation document there are mechanisms, such as sub-leasing, by which an auction winner may facilitate another party in the time after this date. Any such arrangement should be at the discretion of the new assignee.

Comreg has referred to the previous transition plan that was implemented after the 2012 MBSA auction. At that time all four mobile operators were swapping assignments, while offering services before, during and after the process dates. The changes required a high level of co-ordination among operators. The management of transition arrangements in the 3.6GHz band should be more simple than this previous transition, the previous transition was made more complex as the date of the 2012 auction was too close to the first change date (TS1 date ). This was the reason for a transition plan which ran past the TS1 date. But this is bad practice. Any transition process should be complete before the Effective date of new licences. This better outcome was achieved with the TS2 changes that arose from the 2012 MBSA. Comreg should plan the auction date far enough in advance to ensure completion of transition before the change date.

Having a strict cut-off for current licences will ensure that Comreg do not generate incentive for current operators not to take part in the upcoming auction. There is also a risk that uncertainty in the position of current player's post 2017 would influence new bidders or even prevent them from bidding.

The end date of current licences has been well flagged, with adequate time for existing operators to make any required arrangements.

- Transition Proposal 1: the formulation of a transition plan for the 3.6 GHz band;

We agree with the formation of a Transition Plan, but the activities should be planned to be completed before the effective date of new licences.

- Transition Proposal 2 :

It may be necessary to produce a Transition protect licence, but the time scale short be short. We suggest not longer than six months.

- Transition Proposal 3: the Transition Unprotected Licence.

We would not agree with the proposal to generate a Transition Unprotected licence. This compromises the auction which should generate the best option for customers. This could also provide incentive to ComReg to artificially set higher minimum process in the auction.

Comreg have the opportunity to organise the auction to produce efficient assignments post auction. Certainly a proposal to form any transition plan running to five years is unreasonable.

We would argue that Comreg do not need to take any extraordinary steps to protect current customers:

There are few customers using this spectrum, 27,000 customers, a very small number of users/MHz compared to other bands.

Both UMTS900 and 4G at 800MHz have been rolled out to many parts of the country in the last two years. Many of the existing FWA customers could now get an alternative service.