



Public Consultation on Spectrum Policy

**Submission to Department of Communications,
Energy and Natural Resources**

Western Development Commission

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Western Development Commission

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1.0 Introduction and Background

The Western Development Commission (WDC) welcomes this opportunity to present its views on spectrum policy and hopes that it can contribute to advancing thinking in this important area. In this submission we set out the WDC's views, particularly with regard to the relevance of spectrum policy for the delivery of broadband infrastructure to rural regions.

The WDC is a statutory body whose primary purpose is to promote, foster and encourage economic and social development in the Western Region (counties Donegal, Sligo, Leitrim, Mayo, Galway, Roscommon and Clare). This is a predominantly rural region of relatively few large centres, many small towns and scattered settlement.

The WDC works in co-operation with national, regional and local bodies involved in western development to:

- review and monitor development policy and its implementation in the region, identify any changes and adjustments needed and make appropriate proposals to government departments and agencies;
- identify and implement development initiatives, or facilitate their implementation by other relevant organisations; and
- assist businesses, social enterprises and projects through operating the WDC Investment Fund.

As part of its remit, and of its strategic aim of contributing to the creation of a high quality economic and social environment in the Western Region, the WDC has been active in highlighting the infrastructure deficits that affect the region's ability to attract inward investment and to grow indigenous enterprises. Lack of access to quality broadband telecommunication infrastructure is one of the deficits inhibiting many businesses already operating in the region, and discourages others from locating there.¹

The WDC was represented on the Information Society Commission (ISC)² and chaired the Broadband Working Group. The ISC strategy documents *Ireland's Broadband Future* and *21st Century Infrastructure* provided thorough analyses of the significance of broadband infrastructure for Ireland's economic growth and competitiveness, and drew attention to the continuing gap in broadband access between larger towns and smaller centres.

¹ The WDC provided an analysis of broadband issues in *The State of the West* (2001) and *Telecommunications in the Western Region* (2002).

² The Information Society Commission was an advisory body to the Taoiseach from 2001-2004. See www.ISC.ie

While significant advances have been made in rollout nationally and in larger regional centres, using fixed, wireless and mobile technologies, progress in rural areas has been limited. Even where wireless and mobile technologies have been deployed, services are often patchy, unstable, and with limited capacity.

It is for this reason that the WDC regards the use of the so-called 'digital dividend' from the switchover from analogue to digital TV, to enable high speed broadband services to be rolled out in rural areas, as an unprecedented opportunity to bridge the 'digital spatial divide'. Indeed, the EU Commissioner for Information, Society and Media has identified the spread of rural broadband as a key positive impact of this switchover which is expected to take place by 2012, freeing up spectrum capacity for use by television, mobile telephony and fixed broadband services.

The *DCENR Report of the Working Group on Spectrum Policy* referred to the 25-30% of the spectrum in the UHF broadcast band that would potentially be available for use after the move to digital television. One of the key uses of this spectrum could be the provision of quality broadband access to rural areas.

In October 2008, the US Federal Communications Commission (FCC) Office of Engineering released a report *Evaluation of the Performance of Prototype TV-Band White Space Devices*. The Commission conducted laboratory and field tests of prototype 'white space' (vacant TV channel spaces) devices, and is about to authorise licences for the operation of new low-power devices in the TV broadcast spectrum at locations where individual channels/frequencies are not being used for authorised services. This will allow the use of 'white spaces' for the provision of affordable broadband, particularly in rural or urban areas not covered by mainstream providers. The FCC has also approved a proposal to open up parts of the radio spectrum for unlicensed users.

Studies in the UK suggest that around 100MHz of white space spectrum may be available in 90% of locations, in addition to the 25-30% of spectrum referred to above.

2.0 General Spectrum Policy

The *DCENR Report of the Working Group on Spectrum Policy* makes the distinction between spectrum where market forces ensure assignment through the use of market mechanisms, and spectrum where assignment is not subject to market forces, for example spectrum assigned for use in public safety, security etc. While this distinction is welcome, the WDC feels that these categories are broad and the policy should explicitly identify rural and less populated geographical areas as requiring more than market assignment mechanisms to ensure that the residents and businesses of these areas can avail of wireless access to services such as high quality broadband. The WDC believes that specific measures need to be put in place to ensure that rural and less populated areas of Ireland have access to the services that use the spectrum, including high quality broadband.

Services that use spectrum for the delivery of wireless broadband include:

- mobile and nomadic broadband services which are required in all locations in the state;

- fixed broadband³ services to residential and business customers.

Mobile and nomadic services – coverage in rural areas

Spectrum policy has a part to play in ensuring that the voice and data mobile networks are extended into rural areas and consideration should be given to:

- coverage requirements when national licences are being issued;
- measures to ensure that the opportunities afforded through digital dividend spectrum and/or spectrum re-farming are used to extend rural coverage.

Use of wireless to deliver Next Generation Access to high quality broadband

It is important that spectrum policy takes cognisance of the role of wireless in Next Generation Access (NGA). Whilst most commentators would agree that fibre optic-based networks such as Fibre to The Home, Fibre to the Curb and Fibre to the Building provide the most future proofed method of NGA, it is important to recognise that it will be many years, if ever, before these technologies will be available to more than even 50% of the population in Ireland. It is clear that the only option for many locations will be either copper-based or wireless solutions. Use of copper for the delivery of broadband is dependent on its quality and the customers distance from the exchange and therefore is only a small part of the solution for NGA in rural and less populated areas of Ireland, with the remainder depending on wireless access technologies.

Spectrum policy needs to acknowledge that the use of wireless technologies will be the only alternative for the provision of NGA in many parts of Ireland. The policy needs to explicitly recognise this fact and take account of the knock-on economic, environmental and social benefits of spectrum to the development of the more rural parts of Ireland.

Spectrum policy required to cater for rural residences and business

Spectrum policy needs to ensure that national wireless services are rolled out to rural areas as well as urban areas and also recognise the special requirements of those areas that are unlikely to receive services delivered via cable and/or deep fibre networks for a long time, if ever.

Policy can cater for the rural situation via a number of options:

- obligations in national licences;
- geographical licensing schemes such as the successful Fixed Wireless Access Local Access (FWALA) scheme in the 3.5GHz and 10.5GHz bands;
- encouraging use of the white space or interleaved spectrum;
- putting in place clear device parameters for use in an unlicensed spectrum regime, including the unlicensed use of white space.

2.1 Management of spectrum

The *DCENR Report of the Working Group on Spectrum Policy* states:

³ Fixed broadband service could be provided using mobile technologies such as WiMax or HSPA, the distinction here is that users generally access the service from their home or place of work.

If access to spectrum is free, service providers have no incentive to minimise their use of this resource and thereby release it for other possible uses. Price-based incentives can encourage service providers to behave more efficiently, in their own interests. These incentives can take the form of either direct pricing of the spectrum, or trading. A spectrum fee will prompt a real examination of requirements and an exploration of options for reducing them. If the spectrum they hold is made tradable, service providers are faced with the opportunity cost of using spectrum. If they hold on to spectrum that they don't need, they are forgoing the revenue they might otherwise earn by selling or leasing it. Incentives of this sort remove some of the burden of deciding the most efficient use from the spectrum manager or regulator, because parties are motivated to act in their own interests while, at the same time, serving the interests of good spectrum management.

While we agree that price-based incentives can encourage service providers to behave more efficiently and that these incentives will remove some of the burden of deciding the most efficient use from the spectrum manager or regulator, there are other factors which will influence operators actions and the spectrum manager will need to have the tools to monitor the spectrum and intervene if necessary.

For example, service providers may fear damage to their existing assets (e.g. interference or additional competition). In principle, service providers should still be able to quantify these in monetary terms and thus value their access to the spectrum. However, these fears could lead to service providers placing a high value on their spectrum, making the price uneconomical for secondary users.

Service providers may not want to release any spectrum in rural areas even if they don't use it themselves, for a variety of reasons including:

- maintaining 'real options' i.e. an alternative or choice that becomes available with a business investment opportunity at some point in the future;
- reduced flexibility in planning and maintaining the network;
- the risk of not being able to meet future changes in demand in some scenarios (e.g. new housing build, data demand growth).

For instance, operators might place a particularly high value on the 'real options' if the spectrum was in high demand and trading illiquid (because they might have to consider the cost of alternative solutions in different bands, for example, if they did need additional capacity). If a service provider needed nationally available spectrum in the future this would deter it from selling regional pieces because it might be too difficult to repurchase them if needed. Moreover, if a purchaser had added a lot of value to it by building, for instance, a €1bn network, it would not be easy for another operator to 'buy back' such spectrum and compensate the original purchaser. However, if service providers are permitted to allow for such contingencies assets are potentially left unused.

By the same token, service providers can demand a high compensation price for such risks. This might undermine the business case of the alternative or secondary user.

Other practical measures to counteract these tendencies and maximise use of the spectrum include:

- basing charges on an ongoing fee rather than payment up-front so as to incentivise the service provider to monitor its use of its spectrum;
- ‘use it or lose it’ clauses with some ‘minimum requirements and timing’. This, for example, has been discussed in Spain in view of the "zero" efforts shown by some of the parties awarded DTT multiplexes, so that a compelling content proposition is not being developed;
- making some spectrum available on a regional or geographic basis;
- allowing differences in spectrum pricing between areas of high population density (where there is spectrum congestion) and those areas where population density is lower – this will, of course, require careful definition of geographic areas covered by regional licences.

2.2 The existing Fixed Wireless Access Local Access (FWALA) scheme

In 2001, ComReg launched the FWALA scheme to provide licence spectrum in the 3.5GHz and 10.5GHz bands. The scheme was well designed and has contributed to a successful Fixed Wireless Access sector in Ireland. The design included:

- designated geographical areas where a licensee had exclusive access to a band of spectrum;
- simple application procedure;
- simple procedures and processes to ensure minimum interference;
- 7 year license term;
- low cost.

The take up of the scheme and the number of wireless customers served by the licensed service providers using the FWALA spectrum is testament to the success of the scheme. The total number of wireless subscribers represents in excess of 15% of all fixed broadband subscribers in Ireland. This is by far the highest penetration level of Fixed Wireless subscribers in Europe.

The WDC recommends that similar geographically-based schemes are an integral part of spectrum policy in Ireland, allowing for the growth of regional providers of broadband in those areas that are not attractive to all wireless providers.

As rural-based networks are coverage rather than capacity limited and technologies which use lower frequencies have greater range than technologies that use higher frequencies (all other factors being equal), consideration should be given to earmarking some lower frequency spectrum for this purpose.

3.0 Use of Digital Dividend

3.1 Allocation to non broadcasting services

Typically, non broadcast users such as Vodafone or O₂ are licensed to operate across a band of spectrum nationally. Other users of spectrum such as Digiweb, Irish Broadband and Clearwire have licensed bands of spectrum which are confined to specific geographic areas.

The DCENR Report of the Working Group on Spectrum Policy states that it is expected that some 25 to 30% of the spectrum currently reserved for broadcast services will be made available for non broadcast services such as broadband access, mobile broadband and mobile TV.

The WDC recognises the importance of both regional and national licences and recommends that part of the digital dividend spectrum is allocated to each.

The ITU World Radio Conference (WRC) in 2007 identified 790-862MHz for mobile services (on a co-primary basis with broadcasting) – hence there is an emerging interest around the top end of the digital dividend spectrum for mobile/broadband. The WRC decision came about following studies conducted in Europe and other regions which considered a number of factors – ability to re-tune existing equipment, likely worldwide availability of spectrum, harmonisation with US 700MHz spectrum allocations and handset design amongst other things. Taking all of those things together, the top end of the spectrum came out as preferred for mobile/broadband.

While the WDC would support the use of this spectrum in this way, we would suggest that some spectrum in the lower frequency ranges is earmarked for regional technology/service neutral schemes such as FWALA.

In addition, innovation should be encouraged through well-designed licence exempt parameters and the availability of trial licences throughout the spectrum band.

3.2 Allocation to broadcasting

Broadcasting spectrum is licensed in a different way to other services, as it is not licensed as a single national or regional band but is licensed on a per site basis. RTÉ is not allocated a band which they use nationally; instead transmitters on particular mountain tops (such as Threerock overlooking Dublin) are allocated a number of distinct channels within the band. This allocation method means that there are areas of “white space” or unused spectrum in the broadcasting bands throughout the country which if managed properly could possibly be used by other users.

White space or interleaved spectrum

One way forward is to allow users to access spectrum without a licence, subject only to certain operating conditions, for example transmission power. This is known as a spectrum commons. A further method is to establish an agreement or protocol allowing a secondary user (at user other than the spectrum owner) to transmit on a frequency when it is not being used by the owner (also known as the primary user), the primary user is able to transmit at any time in the spectrum for which it holds a licence, but secondary users may transmit in this spectrum only if it is clear that the transmission will not cause interference to the primary user. This is known as the white space method (sometimes also called interleaving or white space interleaving).

Interference is the major challenge: is there a solution?

The current owners of spectrum, who in the case of the TV bands are part of the broadcasting and programme-making and special events (PMSE) sectors, are concerned that secondary users will

introduce interference and reduce the overall quality of service that the primary user can offer. They cite the hidden node problem as a particular issue.

The hidden node is a well-recognised phenomenon in radio-spectrum planning: two or more nodes share a common channel by means of some agreed protocol, but, due to certain propagation conditions, one node is unable to sense any other node and transmits. This transmission causes interference to all other nodes in the network. In the case of the TV broadcasting spectrum, the hidden node might be a low-power transmitter that is unaware of the active broadcasting network and so begins to transmit, disrupting the TV broadcast.

There are two methods for overcoming the hidden node problem, and these are sufficient for all practical purposes:

- using a beacon signal;
- limiting the power of secondary transmissions.

A beacon signal is transmitted in tandem with the TV broadcast, typically as part of it or using a separate transmitter and the broadcast tower network. The beacon lists the frequencies upon which transmission will cause no interference to the primary user, and the secondary user may only use one of these. The secondary user is not allowed to transmit if the beacon signal is not detected.

Although there are ways of limiting the interference effect that may satisfy requirements on deployment, a comprehensive solution to the problem of interference is not trivial and will probably demand the development of novel radio technologies called cognitive radios. Cognitive radio is the term used to describe an intelligent radio which has the ability to sense its presence in time and space and, based upon past usage habits and an ability to ‘learn’, can offer the user the most viable communications path, measured in terms of quality of service, cost and channel preference. The benefits of a cognitive radio are numerous, but in the context of this submission a cognitive radio would incorporate the functionality required to operate as a secondary user in a spectrum-sharing application in any one of a number of channels without interfering with the primary user. Some current wireless communications devices, like WLAN and DECT phones, have a basic ability to sense the level of interference and to switch to an alternative channel, but this is insufficient to fulfil the requirements of a white space spectrum-sharing scenario.

Developments in the USA and the UK

Since 2002, the USA has been leading the enquiry into how to overcome the challenges of using white space. Although any benefits will be limited to the USA in the short term, in the longer term the outcome of this investigation will have a significant impact for Europe and possibly the rest of the world. The value of spectrum, and the social and economic benefits of its efficient use, is likely to push Europe to follow the same route as the USA. This is unlikely to happen unless certain regulatory and technical challenges are overcome. These include analogue switch off, and agreeing methods to overcome the hidden node problem (see above). If these technical challenges can be overcome and allocation of white space is allowed, the impact will be substantial, changing the way in which spectrum is assigned, services are deployed and spectrum is traded.

In the UK, Ofcom has given details of its plans for the release of spectrum in the so-called white spaces between digital TV signals after switchover. It follows the announcement in the summer on the award of cleared spectrum that will become available after analogue switch off.

A recent Ofcom consultation covers the geographical white spaces that will exist between transmitter areas. The capacity can be used for new low power services including national or local broadcasts, special events and possibly mobile TV or mobile broadband.

The first white space will be released early next year in Carlisle, Cardiff and Manchester. Later phases will offer combined spectrum, allowing national services, with the final awards being made in 2011.

Users would be able to decide themselves which technology they use and the licences would be tradable.

In addition, Ofcom are considering the use of unlicensed spectrum. In September of this year, Professor William Webb of Ofcom provided some insight into their thinking by highlighting the following points:

- the end point is a statutory instrument exempting cognitive devices;
- there is a need to set technical parameters to prevent interference;
- workshops and consultation are ongoing;
- Ofcom will work with Europe and internationally.

4.0 WDC Response to the DCENR's Proposed Principles for Spectrum Policy

This section provides the formal response to the consultation questions as detailed in the consultation paper:

1. Do you agree that the principles listed should underpin the future management of spectrum in Ireland? If you disagree, please state your reasons.
2. Are there other principles that you think should be considered? If so, please state them and your reasons for doing so.
3. In respect of each of the principles listed, are there other issues that should be considered in the context of that principle? If so, please state them.
4. Do you have any other comments that the Department should consider in the development of a national spectrum policy?

4.1 Agreement on principles themselves and other issues that should be considered in the context of the principles (consultation questions 1 and 3)

1. Spectrum management should be dynamic and responsive to stakeholders needs

The regulatory framework for spectrum should:

- *Foster competition, growth and innovation in the use of spectrum.*

- *Promote flexible, open and responsive management of spectrum.*
- *Provide clarity and certainty to stakeholders and the general public regarding spectrum usage.*
- *Take account of the national policy objectives for those sectors that are dependent on spectrum.*
- *Take account of developments in spectrum management in the international environment, such as the ITU at the global level and the European Union and CEPT at the European level.*
- *Take account of the opportunities for collaboration on a North-South basis.*

The WDC agrees that this principle should underpin spectrum management in Ireland. However it believes that an additional point should be added as follows:

- Take account of the requirements of rural and less populated regions of Ireland and should recognise that wireless access to high quality services may be the only terrestrial option available for the businesses and residences located in these areas.

2. Access to spectrum should be easy

- *Regulations on access to spectrum should accord with the principles of Better Regulation.*
- *In authorising the right to use spectrum, the approach adopted should be appropriate for the uses/sectors under consideration.*
 - *Market mechanisms may be appropriate where the use of spectrum is directly subject to market forces (e.g. provision of electronic communications services).*
 - *Where the use of spectrum is not subject to market forces or is required for the provision of security, social, cultural objectives, other mechanisms may be more appropriate.*

The WDC agrees that this principle should underpin spectrum management in Ireland, however it believes that an additional bullet point should be added as follows:

- Recognise explicitly that adequate coverage of rural areas may not happen if left to the market alone. Spectrum used for rural coverage may not be subject to market forces and mechanisms other than market mechanisms may be appropriate for the allocation of such spectrum.

3. Electronic communications services for consumers

Where the use of spectrum is intended to provide a consumer service:

- *Consumers should be able to connect radio equipment and telecommunications terminal equipment of their choice (provided that these comply with relevant standards) to any network.*
- *Consumers should be able to access and distribute any lawful content and use any lawful applications and/or services of their choice.*
- *The emergence of a range of commercial network access models should be encouraged.*

The WDC agrees that this principle should underpin spectrum management in Ireland, however it believes that additional points should be added as follows:

- Consumers in all locations should have access to all services provided utilising the spectrum.
- Consumers living or working in locations where access from alternative sources of high speed broadband is not available are catered for through the use of wireless access.

- The emergence of a range of commercial network access models based on licensed and unlicensed spectrum should be encouraged.

4. Clarity on rights and access to spectrum

In line with best practice, there should be clear rules on, inter alia:

- *The rights and obligations of spectrum users, including:*
 - *Licence duration and position regarding renewal of licence.*
 - *Rights and obligations regarding change of use of the spectrum (flexibility & neutrality).*
 - *Rights and obligations concerning interference.*
 - *Trading rights.*
- *The rights and obligations of the State, including:*
 - *Rights to charge for licenses.*
 - *Right to place conditions on the use of spectrum.*
 - *Rights to change licence conditions.*
 - *Rights to withdraw licences and recover spectrum, if necessary.*
 - *Obligations concerning monitoring and enforcement of spectrum use.*
 - *Rights to lay down trading rules and to limit over-concentration of spectrum.*
- *Procedures for how to apply for spectrum for new and innovative services.*
- *How access to the spectrum is determined (first-come, first-served, auction etc).*

Safeguards should also be provided against the over-concentration of spectrum in the hands of established operators that would prevent new entrants from acquiring spectrum.

The WDC agrees that this principle should underpin spectrum management in Ireland, however it believes that additional bullet points should be added as follows:

- ‘Use it or lose it’ clauses – safeguards.
- Base charges on an ongoing fee rather than payment up-front so as to incentivise the service provider to monitor its use of its spectrum.

In addition, the WDC recommend that the rights and obligations of spectrum users would be extended to include:

- Rights and obligations regarding geographical coverage.

5. Promoting research and innovation

Access to spectrum is an essential prerequisite for research and innovation in wireless technologies. Spectrum policy should promote competitiveness, encourage research and innovation and facilitate international unique experimentation in Ireland. For example, the test-and-trial regime for new wireless technologies and services should continue to be developed so as to maintain responsiveness to the industry’s R&D requirements and the development of services for end users.

The WDC agrees that this principle should underpin spectrum management in Ireland

6. Technology & service neutrality

Taking account of national policy objectives and provided that the associated electronic communications network complies with the relevant technical obligations related to spectrum:

- *Technology and service neutrality should be promoted, where relevant.*
- *The bands in which the principle of technology and service neutrality will or will not be applicable should be specified.*
- *Any limitations on applying the principle of technology and service neutrality in any given band should be specified.*

The WDC agrees that this principle should underpin spectrum management in Ireland.

7. Efficient use of spectrum

In assessing the efficient use of spectrum the focus should not be on economic factors alone. Social and policy objectives also need to be considered.

- *The parameters used to assess efficiency should be appropriate for the use/sector involved as well as the current state of technology development for that use/sector.*
- *A balance should be struck between efficient use, flexibility/technology neutrality and promoting innovative development.*
- *There is a need to balance the benefits of flexibility of use with benefits of harmonised use taking account of meeting the public good and international obligations.*
- *Spectrum pricing should be used to promote the efficient use of spectrum for commercial purposes, where it is congested.*

The WDC agrees that this principle should underpin spectrum management in Ireland, however it believes that the third bullet point should be expanded to explicitly define public good as including digital inclusion.

8. Spectrum pricing should deliver a fair return to the State

The spectrum is a finite natural resource that enables the provision of essential services for both public service and commercial purposes. The price of spectrum to the user should reflect its economic value to that user. Spectrum pricing is made up of two components – the cost of administering/managing the spectrum and the cost of leasing the spectrum.

- *All users should contribute to the cost of administering/managing the spectrum.*
- *The State should get a fair return for the use of this natural resource for commercial purposes.*

The WDC does not necessarily agree that this principle, in its present form, should underpin spectrum management in Ireland.

The price of spectrum needs to reflect both the economic value to the service provider, and the downstream economic value to the regions served by the wireless services.

The WDC believes that spectrum policy needs to explicitly recognise that a fair return for the use of this natural resource for commercial purposes is not measured by licence charges only and that the measurement of return needs to take account of, inter alia:

- indirect returns such as the impact on the environment;
- spectrum congestion;
- digital inclusion.

9. Monitoring and enforcement

Liberalising the way spectrum is managed and used increases the potential for interference to arise.

- *The approach to monitoring and enforcement should be regularly reviewed so as to be able to respond to any interference issues that may arise within a liberalised spectrum management environment.*

The WDC agrees that this principle should underpin spectrum management in Ireland.

4.2 Are there other principles that you think should be considered? (consultation question 2)

The WDC believes that the principle of promoting access for all citizens in the state to high quality broadband should be considered through:

- Obligations in national licences.
- The provision of geographically limited licences in a model similar to the present successful FWALA scheme.
- Continuing to encourage the use of licence exempt spectrum and expanding the licence exempt regime to include the use of white space or interleaved broadcast UHF spectrum. A simple regime detailing minimum specifications which must be met could be considered.

The WDC's reasons for proposing considering this principle are:

- For many of these areas, wireless access may be the only option for businesses and residents to receive high quality broadband services. Fixed technologies such as cable, VDSL and FTTx will not be available in the foreseeable future, and while wireless technologies cannot match the quality and specification of many fixed technologies today, there are wireless technologies which will offer a reasonable quality of service provided enough bandwidth at the correct frequencies is made available.
- To reduce the gap between quality of service in urban and rural areas (the so called digital spatial divide) and foster digital inclusion.

4.3 Other comments that the Department should consider in the development of a national spectrum policy (consultation question 4)

Comments outlined in Sections 2, 3 and 4 of this response

As stated at the outset, the WDC welcomes this opportunity to present its views on spectrum policy which we consider to be fundamental to the knowledge society to which Ireland aspires, and which is strongly based on telecommunication and information technologies. We hope that our concerns are clear and our suggestions constructive.

If there are any queries in relation to the points raised in this submission, we would be happy to discuss it further. Please contact

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