

A Technology Driven Spectrum Policy

An Open and Dynamic Approach to Increase Access and Promote Economic Opportunity

Introduction

This document is a joint submission of Google and the Open Technology Initiative (OTI).

Google's mission is to organize the world's information and make it universally accessible and useful. In seeking to achieve this mission our focus is on web search and related information and communications services. As vital enablers, particularly in making information accessible, we support unfettered access to the Internet, growth in the numbers of Internet users worldwide, and the greater deployment of broadband services. As more and more users worldwide access the Internet through wireless devices, we believe that policy makers have an opportunity to drive Internet use and innovation through the development of open and technology-driven spectrum policies.

The New America Foundation's Open Technology Initiative (OTI) formulates policy and regulatory reforms to support open architectures and open source innovations and facilitates the development and implementation of open technologies and communications networks. OTI promotes affordable, universal, and ubiquitous communications networks through partnerships with communities, researchers, industry, and public interest groups. OTI is committed to maximizing the potentials of innovative open technologies by studying their social and economic impacts – particularly for poor, rural, and other under served constituencies. As an independent non-profit initiative, OTI provides in-depth, objective research, analysis, and findings for policy decision-makers and the general public.

The consultation from the Minister is very timely in terms of a broader EU and global perspective. 2008 has already been a year of substantial advancement and change in spectrum management policy. In the United States, the Federal Communications Commission (FCC) began the year with a significant auction of digital dividend spectrum and in recent weeks issued a historic ruling allowing unlicensed use of the “white spaces” in the television band. This is also a crucial period for policy change in the European Union (EU) with a major debate on EU spectrum policy as part of the consideration of proposals to amend the EU telecommunications legislative framework.

A Unique Opportunity for Ireland

The Internet is dramatically changing how we communicate, how we engage in commerce, and how we participate in the broader society. It is breaking down barriers to education, healthcare, and economic opportunity. It is also transforming democracy, creating the impetus for more inclusive democratic processes, and allowing for widespread participation by individual citizens on a level unseen previously. But the benefits of this communications medium accrue only to those with access. Thus, Ireland must be willing to facilitate and build the necessary 21st century communication infrastructures to provide access for all its residents.

As recent market data from ComReg has documented, Internet users in Ireland show a strong interest in communications services delivered over radio spectrum. A third of broadband users connect to the Internet via wireless and mobile networks and Ireland has a very wide proliferation of wireless hotspots.¹

Among OECD-ranked countries, Ireland is 21st in terms of broadband penetration. While Ireland has made significant progress in recent years, increasing from just 1.6 broadband subscribers per 100 inhabitants in 2004, to 19 broadband subscribers per 100 inhabitants in Q2 of 2008², to gain parity with the rest of developed world and promote affordable and high-speed broadband access throughout the country, it will need to unleash the power of new wireless technologies to bridge the gap. This will require Ireland to modernize its current spectrum policies and focus on management strategies that facilitate more intensive use of spectrum resources and encourage increased technological innovation.

Spectrum policy has largely developed under an assumption of scarcity, and therefore the need to ration spectrum access as means to prevent interference among users. This has resulted in a policy framework that placed state authorities in Ireland and elsewhere in the role of hands-on managers of national spectrum resources. The "traditional" method involved the relevant regulator or agency determining the technology and service to be deployed in particular spectrum bands (allocation) and then managing the granting of rights or licences to use that spectrum (assignment). Since the earliest days of state regulation of spectrum, this approach (often referred to as 'command-and-control') has been dominant. In recent years, states have employed market mechanisms such as auctions and spectrum trading as means for assigning spectrum. In parallel, the designation of specific spectrum bands as license-exempt or unlicensed has opened the way for new and innovative wireless technologies.

But, the reality is that spectrum under current management frameworks is substantially underutilized. An independent analysis of usage in the centre of Dublin (in 2007) highlights that average use across the primary spectrum bands was less than 14 percent. Figure 1 illustrates the findings of this research. These figures are similar to those for a

¹ Source – Irish Communications Market: Key Data Report – Q2 2008, Commission for Communications Regulation, http://www.comreg.ie/_fileupload/publications/ComReg0875.pdf.

² Source – OECD Broadband Portal, http://www.oecd.org/document/54/0,3343,en_2649_34225_38690102_1_1_1_1,00.html.

number of urban areas in other countries, including the U.S. What is striking is how little of the available spectrum space is in use within a command-and-control spectrum licensure regime.

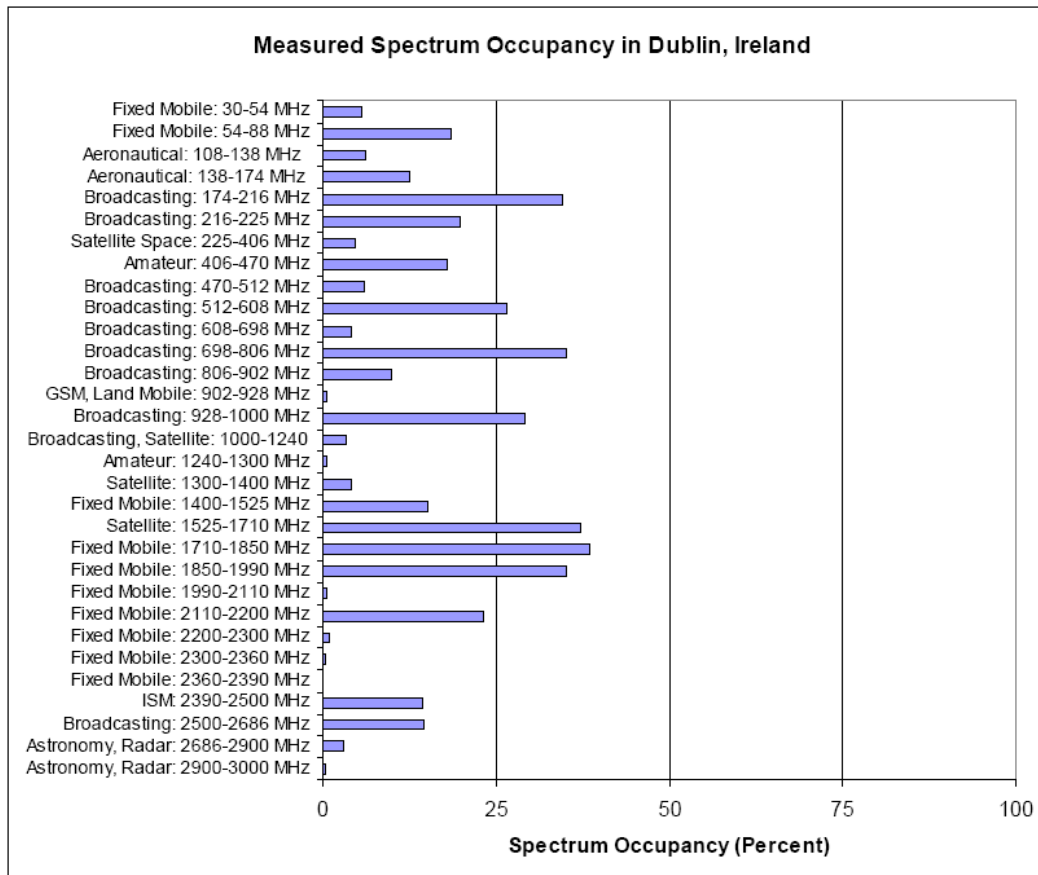


Figure 1. Spectrum use in Dublin.³

In addition, technological advancements in wireless communications are fundamentally changing how we can manage access to spectrum, providing for more equitable and efficient use of this public resource. "Smart" or "cognitive radio" technologies and the shift from analog to digital for various services (e.g. terrestrial TV and public safety services) provide a timely opportunity to reallocate significant blocks of spectrum for new uses and services. In the next several years, Ireland has a one-in-a-generation opportunity to shift how it allocates spectrum resources by moving away from a command-and-control policy to a more efficient, flexible, open, and inclusive approach. Ireland can learn important lessons from the experimentation and policy successes and failures in spectrum regulation around the world and formulate a technology-driven spectrum licensure regime that increases access and creates economic opportunity.

³ Source – Dublin, Ireland Spectrum Occupancy Measurements, Shared Spectrum Company, http://www.sharedspectrum.com/measurements/download/Ireland_Spectrum_Occupancy_Measurements_v2.pdf

The Digital Dividend

The digital dividend (which is the spectrum freed up by the move to digital free-to-air TV) presents a unique opportunity for Ireland, and indeed Europe, to adopt public policies that promote the efficient and innovative use of our scarce spectrum resources. The digital dividend can accelerate broadband penetration and uptake of Internet services for consumers, and bridge the so-called “digital divide” that continues to separate far too many people from the technological tools critical to economic, social, and personal advancement.

As the European Parliament's recent report on this subject emphasizes, "the digital dividend provides the European Union with unique opportunities to develop new services....and to remain a world leader in mobile multimedia technologies whilst bridging the digital divide, providing new opportunities for citizens, services, media and cultural diversity throughout the European Union"

In addition, the Parliament's report also:

- Stressed the potential benefits in terms of innovation and the provision of pan-European services of more coherent spectrum planning at Community level;
- Encouraged Member States to work together and with the EU Commission to identify spectrum that could be harmonised on a technology-neutral basis;
- Called on Member States to develop national strategies by the end of 2009; and,
- Recognised that the increased spectrum efficiency of digital terrestrial TV should allow for roughly 100 MHz of digital dividend to be re-allocated.⁴

In Ireland the Government has committed to completing the roll-out of digital terrestrial TV (DTT) well in advance of 2012. The Minister should accelerate the move to DTT and establish a clear policy framework in 2009 for the freed up spectrum. We share the European Parliament's view that harmonisation with other EU countries should be a priority in developing such policies.

Drawing on experiences from other countries (e.g., the United Kingdom and the United States), we believe that a significant proportion of the digital dividend spectrum should be reserved for re-allocation in a technology- and service-neutral manner. A recent report by consultants for the telecommunications regulator ComReg suggested that the amount of spectrum assigned to alternative uses could be in the region of 80MHz to 120 MHz. The report also found that a majority of Irish households do not rely on free-to-air broadcasting; some 76 percent (and rising) are paying for satellite, cable or MMDS. As a result, an economic analysis in the report concluded that once the initial benefits associated with transitioning analogue broadcasts to digital are guaranteed, there is little

⁴ Source – European Parliament resolution of 24 September 2008 on reaping the full benefits of the digital dividend in Europe: a common approach to the use of the spectrum released by the digital switchover, paras 5, 11, 39, 46, at <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0451+0+DOC+XML+V0//EN>.

potential for increasing the value to society by assigning larger amounts of spectrum to broadcast services.⁵

The transition to digital TV also presents an opportunity to create a framework for greater use of un-used spectrum in TV bands, through the promotion of unlicensed use of that spectrum. We cover this issue in further detail below.

The switch over to DTT provides a tremendous opportunity for Ireland to re-envision its spectrum policies and reallocate valuable spectrum for advanced communication uses and technologies. Ireland is in a unique and enviable position. Its geographic locations and relative lack of congestion in most spectrum bands, provide Ireland with the flexibility and freedom to become a policy innovator in spectrum management, allowing it to quickly reallocate valuable spectrum to further advanced wireless telecommunications and broadband, while also encouraging technological innovation and experimentation. The challenge for Ireland is to develop a broad-based spectrum policy that ensures all Irish citizens can access the benefits of this public communications resource.

A Technology Driven Spectrum Policy: License-Exempt Use

Spectrum use should follow existing consumer demand and continue to evolve with the advent of ever-improving technologies. This is markedly difficult in a command-and-control model (which is dependent upon policymakers to determine how and to whom spectrum should be allocated). One of the most important elements of a policy framework for spectrum use in the 21st Century is to promote flexibility and openness – ensuring that innovation and market mechanisms allow for the best, most efficient and publicly-beneficial use. A more open and equitable spectrum policy would have significant positive impacts on Ireland’s economy, telecommunications, media, and democratic processes.

License-exempt (unlicensed) use of spectrum is essential to developing a spectrum management policy to support innovation and encourage more efficient, diverse, and democratic uses of the airwaves. Unlicensed spectrum use promotes widespread access, lowers barriers to entry for new services and providers, and creates opportunities for individuals and local communities to directly benefit from spectrum resources. Increasing license-exempt spectrum use is essential to facilitating the widespread deployment of broadband access throughout Ireland.

In the UK, Ofcom has described unlicensed spectrum as “a key area for innovation and growth.”⁶ In its September report, the European Parliament recognised the value of unlicensed use of spectrum, as part of the digital dividend, and encouraged Member

⁵ Source – How Ireland can best benefit from its Digital Dividend' Report by Europe Economic, Commission for Communications Regulation, at 6 (para 1.6) and 64, (para 6.40), http://www.comreg.ie/publications/how_ireland_can_best_benefit_from_its_digital_dividend_-_consultancy_report_by_europe_economics.583.103203.p.html.

⁶ Source – Ofcom Spectrum Framework Review (2005) at Sec. 1.3, <http://www.ofcom.org.uk/consult/condocs/sfr/sfr/>.

States "to recognise the social, cultural and economic value of allowing unlicensed users access to the [digital] dividend, in particular small and medium-sized enterprises and the not-for-profit sector, and thus increasing the efficiency of spectrum use by concentrating such unlicensed uses in the currently unused frequencies (white spaces)." The Parliament also acknowledged the benefits of new technologies, such as WiFi and Bluetooth, that have emerged in the unlicensed 2.4 GHz band, and emphasised its belief that allocating a small amount of unlicensed spectrum in other lower frequencies could encourage yet more innovation in new services.⁷

The success of consumer Wi-Fi (802.11a/b/g) has demonstrated the capability of unlicensed spectrum to foster extensive competition in terms of services and devices, encourage rapid technological innovation and research, promote efficient use of spectrum, and allow for a dynamic and technologically service-neutral spectrum management. Wi-Fi technology is moving beyond small scale residential and business local area networks; Wi-Fi hotspots and community mesh networks can now cover entire cities and hundreds of square miles. In Vienna, a community non-commercial wireless mesh network, FunkFeuer Free Net, covers almost the entire metro region. Anyone living within the wireless signal of a current member can connect to the network by simply purchasing an off-the-shelf 802.11 Wi-Fi router. A similar network, Guifi.net, provides connections to over 5,000 homes and hot spots covering over 6,000 km in the Catalonia region of Spain. These networks operate far differently from many (proprietary) systems. Instead of relying on a centralized architecture, these networks are self-built and grow organically, facilitating more democratic access and self-reliance at the local level. Contrary to claims that do-it-yourself networking cannot work or scale, networks in Berlin, Athens, Djursland (Denmark), and hundreds of other locations are quietly proving the viability and sustainability of user-owned and operated networking.

In the United States, a number of cities have built municipal wireless network using Wi-Fi technology on unlicensed spectrum. These networks are connecting city services, helping to streamline costs, while also providing more affordable broadband connectivity to residents. Additional unlicensed networks designed for public safety users are providing mobile emergency communication and data services to first responders. And a number of small, locally owned, Wireless Internet Service Providers (WISPs), are utilizing unlicensed spectrum to provide much needed connectivity in isolated and often under-served rural areas. The success of many of these networks is predicated upon access to license-exempt spectrum.

These examples highlight the potential of unlicensed spectrum to promote broadband and wireless networks at reasonable cost to areas with limited broadband coverage. In Ireland this is of relevance for both rural and inner-city urban areas, where coverage and choice may not be adequate to ensure users have access to high quality, affordable service. The current Programme for Government commits to completing the roll-out of broadband to the 10-15 percent of the country where commercial investment is unlikely to reach.⁸

⁷ Source - European Parliament resolution of 24 September 2008 on reaping the full benefits of the digital dividend in Europe: a common approach to the use of the spectrum released by the digital switchover, paras 30 – 35, <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0451+0+DOC+XML+V0//EN>

⁸ Source – Programme for Government (2007 - 2012) at 19, <http://www.taoiseach.gov.ie/eng/index.asp?docID=3493>.

Unlicensed use of spectrum can play an integral role in achieving this important policy objective.

Unlicensed use of spectrum can also play an important role in the education sector by increasing student access to the Internet both on- and off-campus, thus facilitating better sharing of information and knowledge. EDUCAUSE (an international education advocacy group with more than 2200 institutional members worldwide, including 7 members from the third level sector in Ireland) is an active advocate for increasing unlicensed access to spectrum. Their policy on spectrum, specifically focuses on unlicensed use: "Based on the overwhelming success of the 802.11 [WiFi] standard, EDUCAUSE believes that the improved availability of quality unlicensed spectrum will lead to the development of more innovative and cost-effective technology. This is consistent with our goal of achieving ubiquitous and affordable broadband access for all our campuses and communities."⁹

Open and Dynamic Use of Spectrum: “Smart Radio” Technology and Opportunistic Spectrum Reuse

Although, unlicensed, shared access has facilitated dramatic technological innovation, it has been relegated to just a few spectrum bands, due to concerns regarding interference. "Smart radio" or "cognitive radio" technology offers the potential to address the interference concerns and facilitate widespread sharing of underutilized frequencies across both unlicensed and licensed bands. This technology allows wireless devices to sense their environment or “listen before talk,” detecting occupied frequencies in a given area and only operating on currently unused frequencies. As noted above, spectrum even in licensed bands is often underutilized, with licensed channels unoccupied at certain times or in certain areas. “Smart radios" could utilize that idle spectrum, dynamically hopping from open frequency to open frequency, moving whenever they sense another transmission in the same band. Such technology opens up large swaths of radio spectrum for unlicensed use and provides opportunities for low-power unlicensed networking devices to opportunistically share or reuse underutilized spectrum in low-use bands without interfering with pre-existing licensed users.

The potential of this technology has led Ofcom to approve the principle of licence-exempt use of interleaved TV spectrum for cognitive devices, as long as no harmful interference is caused to licensed users of the spectrum.¹⁰ This follows in the footsteps of the United States, where the FCC issued rules to allow unlicensed wireless networking devices to operate on unused broadcast television frequencies, after carrying out extensive testing of the technology to determine its feasibility.¹¹

⁹ Source – Wireless/Spectrum Management Issues, EDUCAUSE, at 2, <http://www.educause.edu/FederalPolicyProgram/FederalPolicyIssues/1284>.

¹⁰ Source – Ofcom Digital Dividend Review, at para 1.34-1.36, <http://www.ofcom.org.uk/consult/condocs/ddr/statement/>.

¹¹ Source – In the Matter of Unlicensed Operation in the TV Broadcast Bands' and 'Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, Second Report and Order and Memorandum Opinion and Order, Federal Communications Commission, November 14, 2008, http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-260A1.pdf.

The advent of “smart radio” technology allows for the development of a more open and dynamic approach to managing spectrum access. One in which, spectrum can be utilized as a public resource or commons, permitting more equitable access beyond commercial service providers to include local communities and individuals, and allowing for a proliferation of communication devices and networks.

This type of dynamic and open access to spectrum allows for a completely different market structure for telecommunication networks. In traditional licenses, whether obtained via administrative assignment or market forces (i.e. auctions), the onus is on the licensee to incur substantial upfront capital costs to secure the license and build-out the network. This results in slower and more limited deployment that is reliant upon a relatively static business model for recouping the incurred costs. In addition, the licensee often controls the type of equipment used on these networks, constraining innovation and often mandating expensive proprietary hardware. This contrasts with unlicensed or opportunistic use of spectrum where connectivity is driven by consumer-demand, not a limited number of licensees, service providers, or technology bottle-necks. Thus, dynamic use creates a broader market with lower barriers to entry, facilitating open communications infrastructures that support competition among a diverse array of equipment manufacturers, service providers, application and content providers. All of which, promote innovation and lowered costs for connectivity, and democratize access to broadband and other advanced wireless services.

Widespread opportunistic spectrum reuse will also facilitate faster and more robust wireless networks. Current, some wireless networks, both proprietary systems such as 3G and unlicensed Wi-Fi networks, suffer from capacity issues as network data usage increases and users access content and applications requiring larger bandwidth capacity. The solution most often used by providers to increase capacity is to either build out additional wireless base stations or provide existing base stations with access to additional spectrum bands. However, in a management framework that allows for opportunistic use of currently unused spectrum, network devices utilizing smart radio and spread spectrum technology can dynamically access additional spectrum and add bandwidth to alleviate congestion during times of peak usage.

Ireland can become an innovator in license-exempt spectrum access and smart radio technology, dramatically increasing broadband connectivity as well as creating widespread economic opportunity. By actively encouraging innovative spectrum licensure that takes advantage of new wireless technologies, Ireland can become a global telecommunications leader.

Policy Recommendations

In this section we offer a set of principles to incorporate into an overall national spectrum policy framework. A unifying vision of Ireland's spectrum future should be at the foundation of this framework. Ireland should set a goal to develop a leadership position in spectrum innovation and research. An open and technology-driven spectrum policy would be the vehicle to achieve this goal. New legislation supporting these policy recommendations would allow all stakeholders to proceed with clarity.

1. Transparency

To determine whether current spectrum allocations should be freed up from existing uses, increase allocations for unlicensed use, and assess the potential for opportunistic spectrum reuse in specific bands, regulators must have an accurate picture of what entities are using the spectrum and how they are using it. We propose a thorough and transparent analysis of spectrum use that includes both claimed and actual use assessments. This process should be repeated on a regular basis and the data made publicly available. This is of particular relevance to public sector uses where spectrum is allocated/assigned in order to meet public policy objectives and market mechanisms have not been deployed in assignment processes.

2. Lower Barriers to Access and Innovation by Promoting Unlicensed and Opportunistic Use

The key point here; is not just the amount of spectrum, but also the variety of allocations throughout the radio spectrum band. Wireless signals in high and low frequencies have remarkably different propagation characteristics, which are best used for different tasks and services. For example, wireless signals in the television band can penetrate walls and dense foliage, making this spectrum useful for home and business wireless networks as well as spreading broadband connectivity over long distances to isolated areas.

3. Greater Cooperation among Users, both Licensed and Unlicensed

We encourage the Minister to begin facilitating discussions with current licensed users, smart radio device manufacturers and other stakeholders to determine appropriate standards and technical requirements for unlicensed devices to operate without interfering with licensed users. The success of opening spectrum in the 5 GHz band for unlicensed wireless devices provides an early precedent for cooperation among incumbent users and new entrants. In 2003, the International Telecommunication Union (ITU) developed standards for wireless devices to share spectrum in the 5 GHz band utilized by weather and military radar.¹² The U.S followed in 2006, bringing together the U.S. military, spectrum authorities, and device manufacturers to develop technical rules to allow wireless networking devices to operate in parts of the 5 GHz band without interfering with military radar systems. Ireland should follow suit and actively pursue opening up additional spaces to more efficient uses among a variety of stakeholders.

¹² Available at http://iee802.org/18/Meeting_documents/2007_Nov/WFA-DFS-Best%20Practices.pdf

4. Encourage Experimentation and Research

Ireland already has a strong track record of experimentation and research in spectrum and, with proper support, would become a world leader in this area. The Minister should commit to a goal of establishing Ireland as a leader in spectrum research. Blocks of spectrum in all bands should be made available for research and government funding for R&D should be targeted on research with a high potential to establish innovative technology and access solutions for the general public.

Additional Policy Recommendations

Although, we believe that unlicensed and opportunistic spectrum reuse is the key to more open and dynamic spectrum management and spurring widespread deployment of broadband throughout Ireland, we view it as part of broader policy framework to shape telecommunications in the 21st century. We offer several additional and essential policy recommendations to encourage more transparent and efficient use of spectrum resources, promote accessible and affordable access to open communication networks and support extensive competition in the wireless and telecommunications markets.

1. Open Access Networks and Infrastructure

At the core of the Internet's ability to serve as an engine for economic growth, innovation, and free speech, is its open and transparent end-to-end architecture. However, in the wireless and mobile realms, carriers have restricted the types of phones, devices, and applications that consumers can use on their network. These restrictions often determine what device features customers can and cannot access and what software applications and content they can download. Providers also restrict what programmers, device manufacturers and content providers can develop – all of which inhibits innovation, limits competition and increases costs for consumers. Unfortunately, these kinds of restrictions exist in Ireland and in many other European countries. We recommend policies that empower individual end users and limit the ability of service providers to control decisions best left to their customers. Restrictions should only be allowed when documented evidence of harm to the network would result if they were not put in place.

In addition, we recommend regulatory reforms to support open architectures, open technologies and communications networks as means to spread connectivity and promote more equitable access to telecommunications networks:

- Open Access for consumers

Open access policies should require wireless and mobile providers to allow consumers to connect equipment of their choice (provided that these comply with relevant standards) to any network. Specifically, policies should allow consumers to purchase their own equipment and be able to bring it to any provider. In addition, wireless consumers should

be able to access and distribute any lawful content and use any lawful applications and services of their choice.

- Open Access to networks

It is also our view that strong competition in the internet access market, on both wireless and fixed-line networks, protects the open nature of the Internet by giving consumers the ability to choose between different providers – for example choosing open networks over discriminatory ones. Absent robust competition, broadband providers have both the ability and incentive to leverage their market power and unreasonably discriminate among content and application providers. To promote competition, access to networks must be facilitated in a transparent and open manner.

2. Administrative Assignment: Transparency

This is the traditional model of spectrum management where an entity (normally a regulator) allocates spectrum for a specific service or technology and then assigns rights to that spectrum. This form of spectrum management should be reserved for specific, clearly-defined public policy objectives such as delivering public safety services or free-to-air public service broadcasting. A key principle should be transparency of the policy objectives, spectrum needs, and use efficiencies of these assignments. Incentives should be deployed to ensure use that is as efficient as possible and actual use should be reviewed on a regular basis. This form of spectrum allocation should also be carried out in a technology-neutral manner.

3. Market forces: Competitive and Publicly Beneficial Spectrum Auctions

This model can provide an effective means to ensure a fair return to the State for service providers to obtain spectrum access. Allocation of spectrum in this manner should be done in a technology- and service-neutral manner and assignment should occur via transparent and competitive auctions for new spectrum and spectrum trading for existing licenses. However, we caution against viewing auctions as a panacea to achieve spectrum and wireless success. Auctions likewise should not be viewed as equating higher grossing proceeds with best use for the public good. There are clear limitations to auctions, and as such we encourage you to view them as part of a broad spectrum policy and to focus on competitive measures and regulatory obligations that ensure spectrum auctions function effectively and provide widespread benefits to the public.

Ireland can learn both from its own experience of assignments processes and auctions as well as spectrum auctions carried out in other countries to ensure both that the State receives a fair return for use of spectrum and that the public receives widespread benefit from these assignments. In the U.S., auctions have become increasingly utilized to assign spectrum. Although they can provide an effective means to determine the highest economic value of spectrum for a potential use and provide substantial revenues to government budgets, there are clear limitations to auctions in terms of the benefits accrued to the public and their ability to promote competition and innovation. While

auctions can offer a competitive means to allow commercial users to access spectrum, they are susceptible to anti-competitive bidding behavior and outcomes. In addition, auctions tend to benefit the largest and most well-capitalized firms, leading to potential consolidation of spectrum resources and inhibiting competition. They additionally serve as a considerable barrier to citizen and community access to spectrum. We recommend several policies to provide for more competitive and publicly beneficial auctions and encourage the Minister to consider auctions as part of a broad framework for spectrum management:

- Flexible temporary licenses

Many advocates of auctions seek to “propertise” spectrum, treating spectrum as private property akin to owning land. We urge the Minister to guard against privatization of spectrum and continue to ensure that payments for spectrum licenses are considered “user fees” not permanent titles to spectrum bands. Spectrum at auction should be leased for fixed terms, placing all companies on a level playing field and generating substantial revenues for public investment. We also recommend the revenue be earmarked to finance unfulfilled public interest goals such as expanded public investment in broadband, non-commercial media, and civic access to the airwaves for communities.

- Anonymous Bidding and Spectrum Caps

Among the pitfalls of auctions are gaming and collusion by participants. In the recent 700 MHz auction in the U.S., anonymous bidding was employed to inhibit participants from gaming the auction to depress spectrum prices or colluding to keep out new competitors.¹³ To further ensure auctions promote competition, we also recommend establishing specific spectrum caps to limit the over-concentration of spectrum.

- Service Build-out Requirements and Public Interest Obligations

To prevent both “warehousing” and “flipping” of spectrum by firms and to inhibit speculative buying, we recommend specific build-out requirements on auction winners. These “use or lose” requirements can ensure that valuable spectrum does not lay fallow and guard against firms only servicing highly profitable areas, while ignoring less profitable ones. In addition, the Minister should reserve the right to place public interest conditions or obligation on licensed winners, including requiring open access (allows consumers to use “any device, any application”) and wholesale access.

- Wholesale Access

Much in the same way that Irish and EU telecomms legislation requires dominant fixed-line operators to provide for the re-sale of their retail DSL services and access to local networks, it can place similar requirements on wireless and mobile providers to open up their networks. This can be accomplished by allowing unaffiliated entities to purchase

¹³ Source – Second Report and Order, 700 MHz Spectrum Auction, Federal Communications Commission, http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-132A1.pdf.

wholesale access to data transport services or a set-amount of bandwidth to provide broadband or other wireless services to consumers.

Conclusion

On the FCC's approval of unlicensed operation on unused television channels, i.e. the TV "white spaces," Commissioner Jonathan S. Adelstein offered: "White spaces are the blank pages on which we will write our broadband future."¹⁴ Over the next few years, Ireland's policy decisions and priorities will set the trajectory for telecommunications for generations to come. Taken together, the policy recommendations we propose create an innovative platform for building Ireland's next-generation telecommunications infrastructures. They help ensure more efficient and inclusive spectrum use and prevent many of the shortcomings we have witnessed in various market sectors. While some observers are fearful of the evolutions of business models and communications that new technologies mandate, a failure to embrace these innovations will only hamper Ireland's ability to compete in a modern global economy. As Ireland transitions to digital communications, we have a once-in-a-generation opportunity to modernize our thinking and incorporate 21st century technological advances into our spectrum management practices.

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¹⁴ Statement of Commissioner Jonathan S. Adelstein, Unlicensed Operation in the TV Broadcast Bands, November 4, 2008, http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-286566A4.pdf.