Response to Questions in the Second White Paper

"Modernizing U.S. Spectrum Policy"

by

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before the Committee on Energy and Commerce

U.S. House of Representatives

April 25, 2014

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I. Introduction and Summary

At the outset, we want to again commend the Committee for initiating this process to review and update the current Communications Act. As we said in our initial Response, the review is timely because, as a result of technological advances and dramatic marketplace changes, many of which were described in our first Response,[1] the Communications Act does need updating. And, as part of that process, there is no doubt that spectrum policy needs "modernizing" too.

In preparing this Response, our focus is on offering general principles that should guide Congress's consideration in drafting a modernized approach to spectrum policy and the Federal Communications Commission's approach to implementing such a modernized policy. While the Committee's white paper presents a number of questions on specific

[*] While the signatories to this Response are in general agreement, of course, with the views expressed in these comments, their participation as signatories should not necessarily be taken as agreement on every aspect of the submission. And the views expressed are those of the individuals, and they should not be attributed to the institutions with which they are identified.

[1] Free State Foundation Response to Questions in the First White Paper, "Modernizing the Communications Act," January 31, 2014, *available at*: http://www.freestatefoundation.org/images/Response_to_Questions_in_the_First_White_Paper_013114.pdf

topics, we believe, at least at this stage, that the generalized framework presented in these comments offers a more useful approach in responding holistically to the questions than would individual responses to specific questions. Indeed, this approach is consistent with a central theme of our comments: spectrum policy is undergoing its own "convergence" of sorts, and a proper policy framework for spectrum should encourage and anticipate this convergence on a uniform, integrated basis.

To briefly summarize our views: The current administrative fiat approach has its roots in the Radio Act of 1912, which was passed in the wake of the Titanic disaster. It vested authority to issue licenses for wireless communications in the Secretary of Commerce as a means of mitigating interference. After radio broadcast stations began operating in the 1920s – and their broadcasts on the same or nearby frequencies began to interfere with each other – Congress passed the Radio Act of 1927,[2] which created the Federal Radio Commission ("FRC"). The FRC was succeeded, largely without change, by the Federal Communications Commission ("FCC") with the passage of the Communications Act of 1934.[3]

The basic structure of spectrum regulation, which was initially formulated over 100 years ago and has remained largely the same since adoption of the Radio Act of 1927, is based on technological, economic, and legal views that no longer make sense – to the extent they ever did. It is true that in the past two decades there have been some changes, such as the initiation of auctions to award spectrum licenses, which represent positive steps toward a more market-oriented regime. Nevertheless, a key feature of the administrative model that has prevailed in the last century, and which largely continues to

[2] Pub. Law No. 632, ch. 169, 44 Stat.1162 (1927).
[3] Pub. Law No. 416, ch. 652, 48 Stat. 1064 (1934).

prevail today, relies on allocation by the FCC of particular frequency bands for particular pre-specified service uses in accordance with particular pre-specified technical parameters. This process requires the use of extensive, and often pointless and redundant administrative procedures that have long outlived their usefulness. Regrettably, this "command-and-control" administrative regime dramatically fails to promote flexible use of spectrum. As economics scholar Thomas Hazlett, a former FCC Chief Economist and a leading authority on spectrum policy, has explained, "[t]he weakness of the administrative allocation regime is that it regularly resolves potential conflicts among wireless users by suppressing vast amounts of productive activity."[4] Over the past few decades, there have been substantial technological changes, including the advent of digital wireless communications, which have been coupled with the adoption of auctions as the preferred method for the initial assignment of licenses. These developments conclusively show that, whatever the (dubious) rationale for the traditional command-and-control administrative regime in the last century, that rationale no longer has any contemporary relevance.

A modern approach to spectrum policy should abrogate the existing framework and replace it with a system that fosters a robust market in which spectrum rights can be freely traded largely independent of any FCC administrative control. To be sure, any new system of spectrum management will require some transitional periods and mechanisms, but the transitional costs are well worth bearing. Under this market-oriented replacement model, the FCC will still retain a role in spectrum management, albeit a much more limited one, primarily as the operator of a rights-clearinghouse akin to a registrar of

[4] Thomas W. Hazlett, *A Law and Economics Approach to Spectrum Property Rights, A Response to Weiser and Hatfield*, 15 GEO. MASON L. REV. 975, 977 (2008).

deeds. The FCC's role would be reduced to performing a modest "zoning" function where necessitated by clear coordination problems and where necessary, in limited special circumstances, to address special needs such as assuring public safety.

There is a widespread, indeed, almost unanimous, consensus among economists and policy experts that a market system that allows flexible use of spectrum is the best way to achieve the most efficient allocation of most resources. This fundamental proposition holds true for the spectrum resource as well – just as Nobel Laureate Ronald Coase contended in 1959 in his famous article, *The Federal Communications Commission*.[5] Coase showed that clearly delineated property rights and market forces, not government control, would lead to the most efficient allocation of the spectrum resource.[6] Again, during the past two decades, Congress and the FCC have taken some steps towards implementing a more market-oriented regime. Now, as Congress considers updating the Communications Act, any new policy framework must clearly support and foster a market in spectrum property rights, which relies on unencumbered auctions to make the initial assignments of spectrum rights, which thereafter should be freely tradable in the secondary market.

II. Spectrum Regulation in the 20th Century

The FCC's role in regulating spectrum in the 20th century was very different from what it should be today. Our understanding of the spectrum throughout much of the last century, when its uses were more rudimentary and based on far simpler, less efficient

[5] R. H. Coase, *The Federal Communications Commission*, 2 J. L. & ECON. 1 (1959).
[6] As Thomas Hazlett explains, just a year after publication of Coase's *FCC* work, in *The Problem of Social Cost* Coase "demonstrated that resources would be efficiently allocated if rights to property were well-defined and the cost of trading these rights was modest." Thomas W. Hazlett, *Spectrum Tragedies*, 22 YALE J. ON REGULATION 242, 244 (2005), commenting on, Ronald H. Coase, The *Problem of Social Cost*, 3 J. L. & ECON. 1(1960).

technologies, was limited compared to today. To be sure, early on some core uses constituted essential services – most notably ship-to-ship and ship-to-shore radio and other radio transmissions needed for emergency services. In this setting, the Federal Radio Commission, beginning in 1927, and then the FCC, which succeeded the FRC in 1934, served two primary functions: to allocate spectrum in specified frequency bands for specified service uses, and within such allocated bands, to assign frequencies to particular users and ensure that such users did not interfere with each other and (especially) with essential services.

It should be noted that the rationale for this form of administrative command-and-control regulation was weak even then. Prior to the establishment of the FRC, the Radio Act of 1912 required the Secretary of Commerce to issue licenses as a matter of right. Under this system, and prior to the creation of the FRC, courts were already developing workable common law rules to govern rights in spectrum.[7] The transition away from a system that relied on first possession to establish rights to pervasive regulation of the allocation, transfer, and use of spectrum introduced myriad inefficiencies. As noted above, Ronald Coase's study of these inefficiencies led directly to the development of his Nobel-winning work on externalities and his argument that the government should embrace market-like competitive bidding systems (e.g., auctions) to allocate spectrum.[8] While Coase was often dismissed as a heretic in 1959, no one today seriously argues against the superiority of auctions for allocating spectrum. The other alternatives –

[7] See *Tribune Co. v. Oak Leaves Broadcasting Co*. This 1926 Illinois state court decision is reprinted in CONG. REC. – SENATE 215-219 (Dec. 10, 1926). For a good discussion of the *Oak Leaves* case and related common law developments regarding spectrum property rights before the Federal Radio Act was enacted in 1927, see Thomas W. Hazlett, *The Rationality of U.S. Regulation of the Broadcast Spectrum*, 33 J. L. & ECON. 133, 148-152 (1990).

[8] R. H. Coase, *The Federal Communications Commission*, 2 J. L. & ECON. 1 (1959).

comparative administrative hearings and lotteries – consume vast resources to locate spectrum in the wrong hands. Comparative hearings present major public choice concerns because they are an open invitation for never-ending opportunities for lobbying and jockeying in efforts to get the FCC to adopt favorable decisional criteria or other advantages impacting the selection.[9]

Whatever the case that existed for regulation of spectrum in the 20th century, today it is far weaker. Decades of experience with the FCC's various regulatory modalities have demonstrated the weaknesses of command-and-control regulatory methods relative to market mechanisms that rest on property rights and voluntary contract to allocate spectrum use. Indeed, the correct choices are even more critical today because recent technological advances – particularly the development of spread-spectrum, digital, cellular technology – make it possible to coordinate spectrum use on highly efficient platforms that are relatively resilient to interference. The more intensive use of underutilized spectrum thus increases the overall carrying capacity of the system, which could prove critical for the data-intensive uses of the future.

A consequence of these advances is that spectrum applications have been undergoing convergence. Earlier, broadcast radio and television, satellite communications, point-to-point microwave, and cellular technologies were developed using unique analog encoding and transmission technologies. Today they all increasingly rely on similar technologies to transmit digital data. Just as there is broad consensus that

[9] Lotteries avoid some of the public choice problems plaguing comparative hearings. But they suffer from the serious disadvantage that, unlike auctions, they do not allow the functioning of market-based price signals to determine the highest, best use of the spectrum. To the extent that the FCC is not committed to rules that promote unencumbered "clean" auctions – and it certainly hasn't always been so committed – auctions too are subject to public choice concerns as potential bidders lobby to obtain auction rules that favor themselves relative to their rivals.

the silos created by Titles II, III, and VI of the Communications Act are obsolete today, disparate treatment of different spectrum applications within the FCC or between the FCC and other agencies are obsolete and should be phased out.

Over roughly the past 30 years, since the advent of the first cellular and digital technologies, the FCC and Congress increasingly have turned to liberalized and flexible-use licenses, and market-like auctions to allocate them.[10] This welcome development should be prologue to a modernized spectrum policy: the Communications Act review and update is an opportunity to complete and normalize the transition away from the 20th century command-and-control spectrum policy to a market-oriented 21st century policy premised on flexible use and freely transferable spectrum rights.

Here are some concrete applications of the general theory.

III. Changing Understandings of Spectrum

As in other areas of telecommunications regulation, the convergence of once disparate end uses has largely been driven by digitalization. An ever increasing amount of content, now well over half, is distributed wirelessly now encoded in digital form, transmitted by digital signals. As technology continues to advance, the movement toward ubiquitous digitalization – and, hence, toward further convergence – almost certainly will gain momentum.

That technological convergence to digital will make each band of spectrum a closer substitute to all the others for facilitating the transmission of all forms of information. Convergence increasingly allows spectrum initially tasked to one purpose

[10] It is important to observe, however, that even when the FCC has implemented auctions to award spectrum frequencies, it too often has encumbered the auctions with various conditions designed to tilt the auction results one way or the other or to favor certain bidders, say, by use of bidding credits or requiring certain modes of operation. Encumbering auctions with conditions obviously compromises the market-based price-setting function of the auctions.

(e.g., distributing television signals) to be converted to other purposes for which it is equally suited (e.g., wireless data transmission). Of course, sometimes the physical attributes relating to specific bands of spectrum (e.g., how it propagates) may render certain bands more or less suited to specific tasks – concerns that are discussed below. But by and large, technological convergence of spectrum use will lead to greater substitutability across the entire spectrum. The new legal regime should be flexible enough to respond to unanticipated technical changes without having to undertake case-by-case reallocation of spectrum across different uses.

In other words, just as "data is data is data," increasingly "spectrum is spectrum is spectrum." While spectrum may never be fully commoditized, across a broad range of present and future applications, including the majority of actual current uses, spectrum is largely fungible. It is hard to justify any substantial regulation of near-commodity goods.

Over time the amount of spectrum needed for any given application has decreased dramatically. In part this is due to digitalization and increasingly sophisticated compression algorithms. The technology that we use to transmit signals is also far more precise, resulting in less signal “bleed” from one band into adjacent bands. For example, spread spectrum technology yields signals that are less subject to interference from other sources and that are less likely to cause interference to other sources.

These technological changes mean that any given application requires substantially less spectrum today than was required just ten or twenty years ago. Of course, this doesn’t mean that spectrum is any less "scarce" today than it was then, given that new uses will create heavy demands for spectrum released from traditional uses. Taken as a whole, these changes only mean spectrum use today is much “thicker” and

more robust than just a few years ago: at least in principle, many more buyers should be able to participate in the market, each seeking much smaller spectrum allocations than ever before. This is particularly true when we consider "over the top" applications – applications such as Internet-based radio stations, which "transmit" their signals as data over another data network, without requiring a separate spectrum allocation.

The changes over the past 100 years are likely to be exceeded over the next 100 years. Spectrum policy for the 21st century should enable the next century's worth of development on such matters as multicast and broadcast-like content distribution over cellular networks; advances in MIMO (multiple-input and multiple-output) and related technologies, which already are increasing the capacity of existing networks by orders of magnitude; and the latest research in the use of millimeter-wave frequencies for high-speed data transmission.

Similarly, the increasingly powerful "software-defined radio" technologies promise major improvements, especially when combined with wideband radios and variable-frequency oscillators. Historically, each piece of equipment had to be designed to specific applications and frequencies. Newer technologies, however, allow receivers to be manufactured to operate on a very wide range of frequencies – the specific frequencies to be used are selected by software at run-time. For regulatory purposes, this one key change has the potential to sever the historic ties between frequency allocation, licensed uses, and hardware.[11]

[11] The point of discussing some of the current and anticipated technological advances in the last two paragraphs is not to suggest that policymakers should be engineers and understand their intricacies. Rather the point is to show that these advances are consistent with – indeed, strongly bolster the case for – adoption of the flexible use, market-based regime proposed in these comments.

IV. A 21st Century FCC Spectrum Policy

Even with these changing circumstances, there remains a role for the FCC to play in a 21st century spectrum policy. Broadly speaking, the FCC should transition from its historical command-and-control administrative role of allocating spectrum for specific uses and assigning frequencies to specific users to a regime that facilitates a free market that lets spectrum users purchase, mortgage, lease, and share spectrum in accordance with their own business plans. This transition is akin to that of the westward expansion of the United States: in the early years, land was given away in large allocations, to create incentives for private parties to develop new uses and unlock natural resources. Once the land had been mapped, land ownership and use thereafter could be coordinated by the market. Similarly, the first century of spectrum policy allocated broad swaths of spectrum to individual uses and users to develop new technologies and resources; in its second century, there is no need to remain fixated on "high-frequency expansion" to map out the basic contours of the usable spectrum. Today's urgent need is to organize an orderly transition so that the FCC's role will be akin to a "recorder of deeds" that facilitates market transactions.

Making this *transition* requires some specific changes to the FCC's current approach to spectrum regulation. Some of these will be of limited duration and will give way as robust markets displace the existing command-and-control regime.

First, as suggested above, the convergence in use through convergent technologies militates in favor of parallel structural convergence. Within the FCC, this means consolidating bureau functions relating to spectrum (e.g., from the Media, Wireless, and

International Bureaus). Beyond the FCC, it means rationalizing the spectrum management functions of the Commission and NTIA.

Thus, excepting special circumstances, relating, for example, to national security or public safety, the government should yield voluntarily its control over the spectrum resource, except perhaps for that spectrum that it wishes to retain for its own use. For spectrum that it wishes to retain, the government should have to pay market prices so that, for greater transparency, its own costs are on-budget. But, even here, the government should consider leasing spectrum from the private market to satisfy its service needs. The private sector has greater expertise in developing and deploying wireless networks. Competitive forces – which are increased with federal, state, and local governments as customers – are more likely to ensure those networks are technologically current and economically efficient. Supporting government users' specific needs could lead to development of new consumer-benefitting technologies. They could also exploit important economies of scale that would benefit both consumer and government users.

Second, while there may remain some limited role in rare cases for the Commission to zone spectrum for specific uses which depend on distinctive technical characteristics of transmission, the government otherwise should not hold back spectrum for general uses unless it is prepared to bid in the market against others. And the FCC should move away from regulator-defined protective "guard" bands. Where a given use requires the "extra" protection of a guard band that effectively encumbers adjacent spectrum, the licensee should internalize that cost.

Third, the Commission's approach to unlicensed spectrum needs substantially more theoretical development. While our presumption favors licensed spectrum to

promote economic development, an emerging consensus now thinks spectrum policy should embrace both licensed and unlicensed spectrum uses. But the understanding of how that insight is put into operation today, or in the near future, is underdeveloped. So-called unlicensed spectrum today is not actually "unlicensed": its use requires compliance with various requirements imposed by the FCC and industry standards groups. The purpose of these requirements is to mitigate interference and manage scarcity. Users of unlicensed spectrum incur the costs of complying with these requirements and, even when they comply, they still face the risk of congestion.

Importantly, the unlicensed model faces an open question over what happens should its users face scarcity, which could happen if the approach is so widely adopted that its technological approach to scarcity mitigation fails. Should this point of saturation not be reached, licensed and unlicensed spectrum will start to resemble each other: both offer users exclusive use of spectrum; the boundaries of that spectrum are merely being delineated along different dimensions in exchange for either a license fee or the cost of technological compliance. If unlicensed spectrum becomes so popular that its users face scarcity, it is unclear how the Commission would or should respond to this new tragedy of the commons.[12]

Fourth, a proper 21st century spectrum policy will account for the role of receiver design. This discussion results in large part from the social losses that stemmed from the FCC's revocation of LightSquared's permit to deploy a terrestrial data network on

[12] As discussed in the FCC's 2002 Spectrum Policy Task Force Report, there is an "important caveat" to unlicensed models. In that report, the Commission observed that: "An important caveat must accompany any recommendation for a commons model: although there are indications that technology can go a long way to forestall scarcity concerns, if scarcity eventually does arise in particular spectrum bands in the future, then the commons model may need to evolve to address the problem." FCC Spectrum Policy Task Force, *Report of the Spectrum Rights and Responsibilities Working Group* (November 15, 2002).

spectrum adjacent to that used by GPS systems. The issue also ties into the earlier discussion of software-defined radio and issues about congestion on unlicensed spectrum. In the context of the LightSquared matter it is worth stressing that GPS receivers have long been manufactured on the assumption that spectrum adjacent to that used by the GPS system would only be used, if at all, for low-power satellite applications. By the same token, at no point did the GPS users secure any restrictive covenant or other restriction that would confine LightSquared to limited uses on its own spectrum before LightSquared had acquired the spectrum and spent substantial sums developing it.[13]

The general point is that, in a world of readily-transferred flexible-use licenses, hardware manufacturers' decisions about receiver design should not be allowed to hamper or block the otherwise efficient operation of spectrum markets. Software-defined radio and related technologies increasingly give manufacturers the ability to design their receivers in a versatile way so that they are not tied to specific frequencies, encoding schemes, or protocols. A 21st century free market-oriented spectrum policy such as that proposed here would have encouraged the prompt resolution of the LightSquared – GPS receiver issue in a way that would have mitigated the sizeable social losses that have been incurred as a result of the FCC remaining mired in the throes of the traditional administrative fiat regime. As the LightSquared situation illustrates, the current FCC licensing regime discourages market-based transactions that would allow spectrum to be put to productive use in a way that enhances overall consumer welfare.

[13] On the LightSquared – GPS interference situation, see Thomas W. Hazlett, *Tragedy of the Regulatory Commons: LightSquared and the Missing Spectrum Rights*, DUKE LAW AND TECHNOLOGY REVIEW (forthcoming).

V. Conclusion

As the Committee moves forward with its review and update process, especially regarding spectrum policy, we urge it to carefully consider and implement the views expressed in this Response.