

**MARKET-BASED SPECTRUM POLICY TO PROMOTE
EFFICIENT WIRELESS INNOVATION AND INVESTMENT**

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CONTENTS

I.	INTRODUCTION AND OVERVIEW	1
II.	THE COMMISSION’S FUNDAMENTAL APPROACH TO PROMOTING CONSUMER WELFARE IN THE WIRELESS MARKETPLACE SHOULD BE TO PROMOTE AND PROTECT UNDISTORTED COMPETITION	4
III.	PUBLIC POLICY SHOULD PROMOTE EFFICIENT SPECTRUM ALLOCATION	6
	A. REALLOCATE SPECTRUM USAGE RIGHTS FROM THE PUBLIC TO THE PRIVATE SECTOR.....	7
	B. EFFICIENT, MARKET-DRIVEN INITIAL ALLOCATION OF SPECTRUM USAGE RIGHTS AMONG PRIVATE-SECTOR USES.....	10
	C. ADOPT POLICIES THAT PROMOTE VOLUNTARY TRANSACTIONS IN SECONDARY MARKETS.....	14
	1. <i>Do Not Impose Underlays where Spectrum has been Allocated through Market Mechanisms</i>	14
	2. <i>Promote Efficient Spectrum Allocation by Lowering Secondary Market Transaction Costs</i>	19
IV.	PUBLIC POLICY SHOULD PROMOTE THE EFFICIENT USE OF PRIVATE-SECTOR SPECTRUM USAGE RIGHTS	22
	A. ALLOW NETWORK MANAGEMENT	23
	B. LET SUPPLIERS CHOOSE THE FORM OF VERTICAL RELATIONSHIPS	24
V.	CONCLUSION	28

I. INTRODUCTION AND OVERVIEW

1. The Federal Communications Commission (Commission) has opened a proceeding in which the Commission seeks “to understand better the factors that encourage innovation and investment in wireless and to identify concrete steps the Commission can take to support and encourage further innovation and investment in this area.”¹

2. At the request of counsel for AT&T, I conducted an economic analysis of the effects of public policies on wireless innovation and investment, which was attached to AT&T’s initial comments in this proceeding.² I concluded that public policies can promote innovation and investment both directly, by removing obstacles to innovation and investment, and indirectly, by stimulating competition that promotes innovation and investment. However, public policies can also stifle innovation and investment and distort competition. I identified four guiding principles for public policy to promote, rather than retard, innovation and investment:

- *Consumers are best served when public policy promotes efficient innovation and investment in all parts of the wireless ecosystem;*
- *The Commission should not impose de facto innovation taxes or success penalties;*

¹ Federal Communications Commission, Notice of Inquiry, *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, FCC 09-66, GN Docket Nos. 09-157, 09-51 (rel. August 27, 2009) (hereinafter, *NOI*), ¶ 1.

² Michael L. Katz, “Public Policy Principles for Promoting Efficient Wireless Innovation and Investment,” Attachment to Comments of AT&T, Inc., *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *Katz Innovation White Paper*).

- *Absent clear and specific evidence of competitive harms, public policy should not unduly limit coordination among suppliers of complementary system components; and*
- *The Commission should adopt policies that promote and protect competition, not distort it.*

3. I have also been asked by counsel for AT&T to review the comments filed by Google, Inc. and MetroPCS Communications, Inc. in this proceeding in order to determine whether their arguments and analyses provide a basis for amending these four guiding principles. I conclude that they do not.

4. Briefly, my specific findings are the following:

- *The Commission's fundamental approach to promoting consumer welfare in the wireless marketplace should be to promote and protect undistorted competition.* For the reasons that I identified in my initial white paper, consumers are best served by public policies that promote undistorted competition. Nothing in the comments that I have reviewed provide any sound basis for reversing this conclusion.
- *The efficient allocation of spectrum usage rights is central to promoting wireless competition, innovation, investment, and consumer welfare.* Spectrum usage rights are a critical input to the production of wireless communications services. Consequently, the efficient allocation of those rights is critical to promoting wireless innovation and investment. There are at least three fundamental components to an appropriate allocation policy:

— Reallocate spectrum usage rights to the private sector.

- Rely on market mechanisms and undistorted competition to make initial spectrum allocations among private-sector users.
- Facilitate voluntary private transactions to reallocate spectrum usage rights through secondary markets.

Many commenters agree that the reallocation of spectrum rights from public- to private-sector users would lead to the increased availability of existing wireless services and the introduction of additional new and innovative services, all to consumers' benefit. Google also makes several policy proposals that potentially could promote more efficient private-sector use of spectrum rights. The common characteristic that these proposed policies share is that they rely on the working of competitive market forces to promote consumer welfare. Examples include proposals to allow license holders to employ dynamic spectrum auctions and other mechanisms to transfer spectrum usage rights, which could enhance the functioning of secondary markets for the voluntary exchange of those rights.

- *Consumer welfare will be greatest when public policy allows wireless carriers to manage their networks and to engage in undistorted competition.* Network management is important to the successful operation of any communications network, but it is especially important for wireless networks, which face severe capacity constraints and complex operational issues, such as the interaction of the network with millions of mobile transceivers. Spectrum will be used efficiently and fully to the benefit of consumers only if network operators are allowed to undertake extensive network management without undue public policy restrictions.

- *Some of the policies that Google and MetroPCS propose would distort competition to the benefit of specific service providers and the detriment of consumers.* These proposed policies are anti-market, anti-competition, and would very likely harm innovation and investment. Examples include proposals to alter bidding rules to favor smaller bidders and limitations on network management.

5. The remainder of this white paper explains these findings in greater depth and provides details of the facts and analysis that led me to reach them.

II. THE COMMISSION’S FUNDAMENTAL APPROACH TO PROMOTING CONSUMER WELFARE IN THE WIRELESS MARKETPLACE SHOULD BE TO PROMOTE AND PROTECT UNDISTORTED COMPETITION

6. In recent decades, the Commission has overseen a fundamental shift in telecommunications policy from an approach that created and regulated monopolies to one that promotes competition and relies on market forces both to allocate spectrum and to “regulate” provider behavior. This shift has given rise to tremendous consumer benefits in a wide range of services, including long distance telephony, multichannel video distribution, and wireless voice and data services. With appropriate public policies in place, competition will continue to generate consumer benefits in the wireless marketplace in the form of lower prices, greater variety, and higher product and service quality.

7. In a competitive marketplace, those companies that satisfy consumers’ needs and desires earn greater financial returns than those that do not. Competition thus drives firms to act to the benefit of consumers and can play an important role both in promoting innovation and investment and in ensuring that the benefits of that innovation and investment accrue to consumers. It follows that policies that protect competition serve to promote consumer

welfare. It also follows that policies that distort competition generally harm consumer welfare. To further its goal of promoting wireless innovation and investment, the Commission thus should adopt policies that promote and protect the competitive process, allowing consumer preferences to determine winners and losers in the marketplace.

8. One of the widely recognized benefits of relying on competitive market forces rather than regulatory fiat is that regulators inevitably lack the information necessary to determine which supplier actions will maximize consumer welfare. As I discuss in Section IV.A below, network management provides a prime example. The complexity of wireless network management makes it impossible for the Commission to determine the most efficient management practices. This conclusion is a statement about the difficulty of the management problem, not a criticism of the Commission's abilities. This conclusion is also a clear indication that consumer interests are better served by allowing operators to choose their own network management policies. Like the Commission, network operators face a problem that is too difficult to solve with certainty. But this is precisely why consumer welfare is best promoted by relying on competitive market forces. Those network providers that through hard work or luck implement the most efficient network management practices will prosper financially. Those network providers that adopt inefficient network management practices (or practices that consumers find objectionable) will face pressures to change and will suffer adverse commercial consequences if they do not.

9. Network management practices are not the only area in which consumers benefit from the presence of a diverse set of decision makers. For example, the same logic applies to decisions regarding spectrum sharing (*e.g.*, the creation of underlays) and the choice of business models (*e.g.*, whether to adopt a two-sided revenue model). In each case, no one can

say with certainty what the best approach is. First, there may not be a single approach that is optimal in all circumstances. Second, even if there were a unique optimal approach, at present no one may know for certain what it is. Instead, different entities have different views and opinions based on different experiences, information, and analyses. In the absence of restrictive regulations, suppliers in a competitive market will experiment with a diverse array of approaches, and those approaches that are most successful at creating consumer value will prevail.

10. In summary, if the Commission wishes to promote consumer welfare, then the Commission's fundamental policy approach in the wireless marketplace should be to promote and protect undistorted competition.

III. PUBLIC POLICY SHOULD PROMOTE EFFICIENT SPECTRUM ALLOCATION

11. The desirability—from a consumer welfare perspective—of promoting undistorted competition applies to the allocation of spectrum usage rights. The Commission's fundamental approach should be to rely on competitive market forces to promote efficient spectrum allocation and use.

12. There are at least three fundamental components to such a policy framework:

- reallocate spectrum usage rights from the public sector to the private sector to meet the demonstrated need for additional licensed spectrum and to allow experimentation with additional unlicensed spectrum;
- rely on market mechanisms (*e.g.*, auctions) and undistorted competition to make initial spectrum license allocations among private-sector users; and

- lower transactions costs in secondary markets in order to facilitate voluntary private transactions, which will reallocate spectrum usage rights to their highest-value uses.

A. REALLOCATE SPECTRUM USAGE RIGHTS FROM THE PUBLIC TO THE PRIVATE SECTOR

13. As discussed in my initial white paper, one important way in which Commission policies can promote wireless innovation and investment is by licensing additional spectrum for mobile services.³ For reasons explained there, the licensing of additional spectrum would stimulate innovation and investment both directly and indirectly.⁴

14. Many commenters in this proceeding recommend that the Federal Government make more spectrum available for private use.⁵ Demand for broadband wireless is predicted to

³ *Katz Innovation White Paper*, § VI.D.

⁴ *Id.*

⁵ *See, e.g.*, Comments of AT&T Inc., *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *AT&T Comments*) at 68-69; Comments of Clearwire Corporation, *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *Clearwire Comments*) at 10; Comments of Comcast Corporation, *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 at 4-5; Comments of Google, Inc., *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *Google Comments*), § II.D; Comments of MetroPCS Communications, Inc., *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *MetroPCS Comments*) at 40-42; Comments of the Rural Telecommunications Group, Inc., *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 at 3-4; Comments of Sprint Nextel Corporation, *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *Sprint Comments*) at 3-4; Comments of T-Mobile USA, Inc., *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *T-Mobile Comments*) at 17-22; Comments of Verizon Wireless, *Fostering Innovation and*

expand rapidly in the coming years. For example, Cisco predicts that mobile data and internet use will more than double every year from 2008 to 2013.⁶ Several comments filed in the first round of this proceeding make clear that there is a critical need for additional licensed spectrum.⁷ Additional unlicensed spectrum could also be valuable. The Commission should consider allocating very high frequency spectrum—in which communications utilize very narrow beams with short propagation distances and thus are much less likely to suffer interference problems—for unlicensed use.

15. It is notable that those calling for increased allocation of spectrum to the private sector include the four largest wireless carriers.⁸ This fact belies claims that these carriers have economic incentives to warehouse spectrum in order to block competition.⁹ If such claims were well-founded, calling for additional spectrum rights allocations would be self-defeating. The allocation of new spectrum would simply increase the costs of such a warehousing strategy.

Investment in the Wireless Communications Market; A National Broadband Plan For Our Future, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *Verizon Comments*) at 138-139.

⁶ Cisco, Cisco Visual Networking Index: Forecast and Methodology, 2008-2013 (June 9, 2009), available at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360.pdf, site visited October 29, 2009.

⁷ See, e.g., *AT&T Comments* at 68-69; *T-Mobile Comments* at 20; *Verizon Comments* at 144-146.

⁸ *AT&T Comments* at 68-69; *Sprint Comments* at 3-4; *T-Mobile Comments* at 17-22; *Verizon Comments* at 138-139.

⁹ *MetroPCS Comments* at 13-16.

16. As several commenters observed, the public sector controls a substantial amount of spectrum that potentially could be used more efficiently by the private sector.¹⁰ This situation arises because public-sector spectrum users generally do not face the market forces that drive many private-sector spectrum users to use spectrum rights efficiently.¹¹ In particular, public-sector users do not pay for their spectrum usage rights, cannot sell their rights to others, and do not operate as profit-maximizing organizations. Consequently, public-sector spectrum users do not face opportunity costs from inefficiently holding and utilizing spectrum.

17. Google's comments propose the establishment of a database documenting government spectrum use.¹² Because public-sector users do not face the market forces that many private-sector users do, a database documenting public-sector spectrum use could potentially play a valuable role in promoting the efficient use of spectrum by making the nature and intensity of public-sector spectrum use transparent. It is important to recognize, however, that the same does not hold true of Google's proposed detailed database for private-sector users of market-allocated spectrum usage rights. These users already face market forces that create incentives for efficient spectrum use.¹³

¹⁰ See, e.g., *AT&T Comments* at 70-71; Comments of CTIA – The Wireless Association, *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, September 30, 2009 (hereinafter, *CTIA Comments*) at 73-74; *Google Comments* at 17.

¹¹ I say “many” private-sector spectrum users because these market forces are not present for those private-sector users that hold spectrum rights that are for narrowly defined uses and cannot be sold on secondary markets. Broadcast radio and television are perhaps the most notable examples of private-sector uses for which market incentives to use spectrum efficiently are missing.

¹² *Google Comments* at 7.

¹³ This point is discussed further in Section III.C below.

18. In its comments, Google proposes a discussion about “which spectrum bands could or should be reallocated or repurposed.”¹⁴ To the extent that this proposal refers to reallocating spectrum from public-sector to private-sector uses, it is a sound one. To the extent that this proposal refers to having the Commission reallocate and repurpose private-sector spectrum from one use to another, this proposal is unsound. As I discuss below, other public policies would be more effective in promoting consumer welfare. Specifically, instead of reallocating or repurposing existing private-sector spectrum rights, the Commission should: (a) grant licensees additional flexibility with respect to the services they are permitted to offer with their licensed spectrum, and (b) take actions to reduce the transaction costs of using secondary markets to buy and sell spectrum usage rights. Doing so would allow market mechanisms to determine the most efficient use of available spectrum.

B. EFFICIENT, MARKET-DRIVEN INITIAL ALLOCATION OF SPECTRUM USAGE RIGHTS AMONG PRIVATE-SECTOR USES

19. The use of auctions instead of comparative hearings or lotteries to allocate spectrum usage rights has been one of the most fundamental (and successful) shifts in telecommunications policy. The use of auctions, coupled with other spectrum policy reforms implemented by the Commission, has led to the more rapid expansion of existing services and earlier introduction of innovative new services, and has promoted the allocation of spectrum to its highest-value uses.

20. In its comments in this proceeding, MetroPCS proposes a large step backward. In particular, MetroPCS proposes that “credits should be given to applicants in inverse

¹⁴ *Google Comments* at 8.

proportion to the amount of attributable spectrum that the applicant holds in the auctioned license territory.”¹⁵ The proposed credits are substantial. For example, a bidder with 0 to 20 MHz of attributable spectrum in a licensed geographic area would receive a discount equal to 60 percent of its bid for additional spectrum in the same geographic area, while a bidder with more than 60 MHz of attributable spectrum would receive no discount.

21. This proposed policy of favoring those bidders that hold less spectrum would harm consumers and limit competition through several mechanisms. First, the policy would directly distort competition to obtain spectrum by favoring some—potentially less efficient—carriers over others. Success would be driven by regulatory favoritism rather than the ability best to serve consumer wants and needs. Ironically, MetroPCS’s comments in this proceeding implicitly acknowledge this point. In justifying the use of bidder credits that favor smaller bidders, these comments assert that “well-entrenched incumbents with substantial existing infrastructure always will be in a position to pay more for spectrum because their incremental costs of implementing service will be dramatically lower.”¹⁶ This assertion is false; there are many different carrier characteristics that drive the willingness to pay for spectrum, and new entrants have, in fact, exhibited the highest willingness to pay for spectrum licenses in many instances. The important point for the present discussion is that, under MetroPCS’s view of the world, its proposed policy would promote the allocation of spectrum to less-efficient bidders.

¹⁵ *MetroPCS Comments* at 52.

¹⁶ *MetroPCS Comments* at 54.

22. A second mechanism through which MetroPCS's proposed policy would harm consumers and limit competition is by serving as an innovation tax. Bidder credits that disadvantage large spectrum rights holders, such as those proposed by MetroPCS, increase the costs of expansion for a service provider that has developed a successful business model that requires additional spectrum to meet consumer demand for its services. Such bidder credits therefore punish success and discourage firms from competing to attract consumers through improved services and lower prices.

23. In thinking about the effects of public policy on competition, it is essential to remember the fundamental distinction between protecting the competitive process and protecting individual competitors from the rigors of the marketplace. Or, as is commonly stated, competition policy is concerned with harm to competition, not harm to competitors. This principle applies to spectrum auctions. Competing firms are harmed when a firm raises its bid for spectrum usage rights. But that is competition in action. The result is greater revenues for the U.S. Treasury and the allocation of the spectrum rights to their highest-value uses. Policies that limit or distort bidding presumably would benefit certain wireless carriers. However, those policies would also harm consumers in two fundamental ways. First, by lowering auction revenues, those policies would harm consumers in their roles as taxpayers. Second, by distorting the allocation of spectrum usage rights away from the highest-value uses, these policies would harm consumers of wireless telecommunications services directly because the most valued services would not be supplied at efficient levels.¹⁷

¹⁷ The misallocation of spectrum usage rights could—by distorting the choices available to business users—also harm consumers in their roles as workers.

24. In addition to the identities of the entities that receive spectrum usage rights, an important dimension of spectrum allocation policy is the scope of those rights (*e.g.*, the degree of flexibility that the licensee has to choose among alternative uses of the spectrum). In recent years, the Commission generally has pursued an approach of granting licensees increased flexibility in terms of what services they offer. This approach allows market forces to play the lead role in determining which services are offered and consumed. Hence, as I stated in my initial white paper in this proceeding, this approach promotes competition rather than distorts it.¹⁸ The Commission should continue and extend this approach.

25. In its comments, Google similarly urges the Commission to “continue to relax antiquated and burdensome spectrum use restrictions that ‘silo’ specific service offerings within limited frequency bands and result in ‘inefficient spectrum use and reduced technological innovation.’”¹⁹ This proposal is sound as long as it refers to the degree to which spectrum licenses allow for flexible use. The proposal is unsound if it is meant to advocate a wholesale shift in policy toward unlicensed spectrum or in favor of reducing license holder rights to determine whether and to what extent competing interfering spectrum uses will be permitted. As I observe above, there is a significant need for additional licensed spectrum. And, as I discuss below, a sound public policy based on competition and the use of market forces will facilitate voluntary underlays but will not impose underlays.

¹⁸ *Katz Innovation White Paper*, § VI.

¹⁹ *Google Comments* at 16.

C. ADOPT POLICIES THAT PROMOTE VOLUNTARY TRANSACTIONS IN SECONDARY MARKETS

26. In my initial white paper I concluded that the Commission should continue to explore and implement steps that can improve the efficiency of secondary markets for spectrum licenses.²⁰ Promoting voluntary exchange among private parties promotes competition, while—as discussed in my earlier white paper and below—mandatory sharing is likely to distort competition and to act as an innovation or investment tax.

27. In its comments, Google makes two proposals that it asserts would improve the efficiency of secondary markets for spectrum usage rights. As I will now discuss, certain elements of these proposals could—if properly formulated—serve as important steps in the right direction. There are, however, other elements of these proposals that would harm, rather than promote, competition and consumer welfare.

1. Do Not Impose Underlays where Spectrum has been Allocated through Market Mechanisms

28. Depending on how they come about, underlays could be pro-consumer or anti-consumer. A critical driver of the effect of underlays on consumer welfare is whether underlays are voluntary or mandatory. Public policies that facilitate voluntary spectrum sharing serve to promote innovation and investment. In contrast, public policies that impose mandatory spectrum sharing will tend to undermine innovation and investment.

29. In addressing these issues, it is important to understand the modern concept of “harmful interference.” Information is not destroyed by interference. Rather, the cost of disambiguating information is increased. It is critical to recognize that it does *not* follow that

²⁰ *Katz Innovation White Paper*, § VI.

interference is not a problem. Imposing costs on other radio users harms their economic welfare. These costs are just as real as the losses suffered when interference completely prevents what otherwise would have been valuable communication. These costs can also reduce innovation and investment.

30. Google advocates that the Commission adopt “receiver standards ‘that are frequency band or service specific’” and that would reduce or prevent non-cochannel interference.²¹

Although it is possible that higher-quality receivers will promote efficient use of the spectrum, such an outcome is far from certain. Specifically, one must take into account the effect of higher-quality receivers on the costs of the network or other equipment. All else equal, higher-quality receivers are more costly. In some cases, those costs will exceed the benefits. Because these costs and benefits can vary greatly by use and the type of network, the use of such receivers should be determined by market mechanisms rather than imposed by regulators, who are very unlikely to possess the information necessary to make the fine-grained determinations that would be necessary. A well-functioning secondary market will encourage license holders to make the most efficient use of their spectrum. One element of this efficiency may be to incorporate higher-quality receivers to the extent that it is profitable to do so.

31. Google’s comments also urge the Commission to re-examine the adoption of the interference temperature model “as a more balanced and efficient means of quantifying and managing interference among competing users of the RF spectrum.”²² Google’s comments

²¹ *Google Comments* at 25.

²² *Google Comments* at 22.

summarize their proposed approach as “redefine interference: no harm, no foul.” Although this principle sounds sensible in the abstract, it fails to recognize the difficulty of determining harm and it discounts the seriousness of the issue.

32. The interference temperature model sets a ceiling on the operations of underlay users, and an interference floor with which incumbent licensees would have to cope.²³ It is my understanding that there remain significant technical problems with the interference temperature model.²⁴ Holding these problems to one side for purposes of discussion, it is important to recognize that, ultimately, economic efficiency is concerned with what might be termed “economic interference.” That is, economic efficiency is concerned with the effects of physical interference on the dollar costs and benefits realized by various parties from their use of spectrum. Even if interference temperature could somehow fully and accurately measure physical interference, there is little reason to expect that it would adequately measure economic interference.

33. The creation of significant mandatory underlay rights would very likely reduce the incentives and ability of incumbent licensees to innovate and invest. These investment and innovation distortions would harm consumers and economic efficiency.

²³ Federal Communications Commission, Notice of Inquiry and Notice of Proposed Rulemaking, *In the Matter of Establishment of an Interference Temperature Metric to Quantify and Manage Interference and to Expand Available Unlicensed Operation in Certain Fixed, Mobile and Satellite Frequency Bands*, ET Docket No. 03-237, November 28, 2003.

²⁴ Gerald R. Faulhaber and David J. Farber, “Mandated Spectrum Sharing: A Return to ‘Command and Control’,” Attachment to Reply Comments of AT&T, Inc., *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, November 5, 2009 at 3-5.

34. For at least three reasons, reliance on secondary markets and other economic incentives can be expected to lead to more efficient deployment of broadband wireless networks and other new technologies than would creation of government-mandated underlay rights. First, market forces can be expected to create greater incentives to design and deploy receivers and transmitters operated by different users that can co-exist without interference. If underlay rights are efficient, then in most situations market forces can be expected to generate economic incentives for the creation of underlay rights. Private market participants might or might not choose to use an interference temperature approach. Indeed, one might expect several different approaches to be taken. Different approaches would be expected in the short run because parties would have incentives to experiment in attempts to discover the best approach. And, in the long run, different approaches might continue to be applied because of differences in the propagation characteristics associated with different spectrum bands and with differences in the primary uses to which different spectrum usage rights are put.

35. Second, mandatory underlay rights based on an interference-temperature model will create greater uncertainty for incumbent licensees, particularly CMRS providers. The uncertainty about actual levels of interference will result in some combination of lower service quality or higher costs (to mitigate the effects of the interference) and thus lower economic returns to additional investments in CMRS networks.

36. A third, and closely related, reason that reliance on market forces can be expected to lead to more efficient innovation and investment than would the imposition of mandatory underlay rights is that the latter may adversely affect the expectations of potential investors and innovators. CMRS carriers have invested billions of dollars in technology and equipment based on their beliefs about the interference protections that they receive under their spectrum

licenses. Incumbent licensees built out their systems and made numerous technical decisions in reliance upon governmental policies that restrain third parties from creating harmful interference. The returns earned on these investments could be seriously diminished if the Commission's new policies were to result in significantly less effective protection from interference. Although past investments are largely sunk costs at this point, the Commission's policies could adversely affect future investment and innovation by CMRS carriers, as well as by other service providers whose use of the spectrum is subject to Commission jurisdiction.

37. Google's comments urge the Commission to make "access to otherwise licensed and exclusive-use spectrum bands ... available to non-interfering 'underlay' users."²⁵ Non-interfering users can gain this access without government-imposed underlays. Specifically, a private license holder can relicense its spectrum usage rights to underlay users. For example, a firm could acquire an exclusive-use license and then reach agreements with various manufacturers of wireless devices that would allow users of those devices to operate as underlay users. Whether this licensing approach is feasible depends upon the level of transaction costs in implementing it. Proponents of unlicensed spectrum usage claim transaction costs would be huge, but they do not provide meaningful support for this assertion. In fact, in many other contexts intellectual property rights are licensed to large numbers of manufacturers successfully. Examples include technologies embodied in CDs, DVDs, MP3, and MPEG.²⁶ These examples demonstrate that the transaction costs associated

²⁵ *Google Comments* at 24.

²⁶ Philips, Licensing Programs, available at <https://www.ip.philips.com/services/?module=IpsLicenseProgram&command=Search>, *site visited* October 9, 2009. Licensing is also common in other fields such as medical technology, where cell lines for breast cancer research and gene therapy for Parkinson's disease have been

with licensing are not inevitably insurmountable when licensing involves a large numbers of devices and several different device manufacturers. It is not evident that the licensing of spectrum is any less feasible than in these other cases, especially in situations where there is a single license holder for a broad geographic area.

2. Promote Efficient Spectrum Allocation by Lowering Secondary Market Transaction Costs

38. Google states that spectrum access problems “can be alleviated by a more open and market-driven spectrum access policy.”²⁷ Google is absolutely correct that market-driven spectrum policy is the best feasible approach.

39. There are several policies that the Commission could adopt in order to reduce transaction costs in secondary markets and thus promote economic efficiency and consumer welfare. For example, Google advocates that the Commission confirm that any licensee may engage in dynamic spectrum management techniques such as dynamic auctions.²⁸ This would allow existing licensees to sell the rights to spectrum for specific units of time. Such a mechanism could potentially improve the functioning of secondary spectrum markets, provide clarity to license holders, and expand the flexibility of spectrum use. This is thus a suggestion that, if enacted, could promote more effective markets for spectrum rights, greater spectrum efficiency, and, consequently, greater competition, innovation, and investment.

disseminated. See Lawrence Berkeley National Laboratory, Success Stories: Licensed Technologies, available at http://www.lbl.gov/tt/success_stories/licensed-techs.html, site visited October 9, 2009.

²⁷ Google Comments at 9.

²⁸ Google Comments at 10-11.

40. Consistent with Google’s comments, the Commission should facilitate the use of such mechanisms without imposing them. It is important to recognize that, although dynamic auctions may be the best approach to allocating spectrum in some cases, this need not be so in all cases. It follows that economic efficiency and consumer welfare are best promoted by giving licensees the freedom to engage in these practices on a voluntary basis; dynamic auctions should not be mandatory.

41. There are other steps that public policymakers could take to facilitate the operation of secondary markets. One step would be to make certain data readily available. Google proposes that:

the Commission should establish a publicly available online database that enables users to determine quickly and accurately, across the entire RF spectrum, what spectrum is available and if so whether it is available for use on a licensed or unlicensed basis; whether the spectrum has been licensed; licensee ownership and contact information; license term and conditions, including buildout conditions; and licensee filings such as buildout showings, renewal applications, and modifications. The database should permit user searches by multiple parameters, such as frequency band or geographic area, thus making it possible for a user to readily determine, for example, all licensees within a specified frequency range, or all licensed spectrum within a particular market.²⁹

I understand that the Commission already operates publicly-accessible databases that identify the private entities that have active spectrum licenses, the geographic scope of the licenses, and the terms and conditions associated with the licenses.³⁰ Improvements to these systems to make them more user-friendly (and to include appropriate information about spectrum held by government users) could improve the functioning of secondary markets for spectrum by

²⁹ *Google Comments* at 6-7.

³⁰ These databases include the Universal Licensing System (“ULS”), Broadcast Radio and Television Electronic Filing System (“CDBS”), and the Table of Frequency Allocations.

making important information easily available. By facilitating voluntary transactions in secondary markets for spectrum rights, this proposal would promote the efficient use of spectrum and, thus, competition, innovation, and investment.

42. Google's comments also propose that this database include information about spectrum usage such as "location and operating parameters of each transmitter; whether each transmitter operated continuously or intermittently; and spectrum occupancy measurements."³¹ This information would be burdensome to spectrum holders to maintain, would likely require parties to reveal proprietary information, and could raise security issues.³² Moreover, such information exchange is unnecessary in a market-driven system. In the presence of a secondary market for spectrum licenses, a license holder faces an opportunity cost of using spectrum: the value of the license holder's spectrum on the secondary market. Economically rational license holders recognize the opportunity cost of their spectrum usage and, consequently, have incentives to use spectrum efficiently and to share appropriate information with potential trading partners subject to appropriate non-disclosure protections.³³ Stated another way, in a market-based system, a license holder that wastes spectrum is wasting its own money and profit-maximizing firms have incentives not to

³¹ *Google Comments* at 7.

³² See Reply Comments of AT&T, Inc., *Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future*, GN Docket Nos. 09-157, 09-51, November 5, 2009 at 47-48, which raises concerns about the practicality of providing accurate information on hundreds of millions of mobile transmitters, as well as concerns about national security and trade secrets.

³³ When I discuss efficient spectrum use, I am referring to economic efficiency. Some analysts use the term spectrum efficiency to refer to the amount of information transmitted utilizing a given amount of bandwidth without regard for the cost of the underlying network. The concept of economic efficiency takes into account both the opportunity cost of the spectrum and the cost of the network.

waste money. Hence, in those cases where the spectrum license holders can sell their licenses, there is little benefit to offset the costs of the proposed information collection.

IV. PUBLIC POLICY SHOULD PROMOTE THE EFFICIENT USE OF PRIVATE-SECTOR SPECTRUM USAGE RIGHTS

43. There are several elements of spectrum policy that are complementary to those identified in the previous section. In particular, consumers will benefit when license holders are allowed to put their spectrum rights to the highest-value uses and to manage their networks to maximize the benefits derived from them.

44. Google and MetroPCS favor regulatory restrictions on how wireless network operators can manage their networks and their relationships with other members of the wireless ecosystem.³⁴ The comments fail to take into account the adverse effects that such policies will have on consumer welfare. In its comments, Google correctly recognizes that “wireless is different than wireline in terms of both technical constraints and market structure.”³⁵ But the comments fail to recognize the central policy implications of those differences. First, the technical constraints faced by wireless networks increase the costs of public policies that

³⁴ See, e.g., *Google Comments*, § IV; *MetroPCS Comments* at 19-21. MetroPCS focuses on handset exclusivity, a topic I have addressed elsewhere and, consequently, do not address here. (See, Michael L. Katz, “An Economic Analysis of the Rural Cellular Association’s Petition for Rulemaking Regarding Exclusivity Arrangements between Commercial Wireless Carriers and Handset Manufacturers,” attachment to “Comments of AT&T Inc.,” *In the matter of Rural Cellular Association Petition for Rulemaking regarding Exclusivity Arrangements between Commercial Wireless Carriers and Handset Manufacturers*, RM-11497, February 2, 2009; Michael L. Katz, “An Analysis of Comments Regarding the Economics of Exclusivity Arrangements between Commercial Wireless Carriers and Handset Manufacturers,” attachment to “Reply Comments of AT&T,” *In the matter of Rural Cellular Association Petition for Rulemaking regarding Exclusivity Arrangements between Commercial Wireless Carriers and Handset Manufacturers*, RM-11497, February 20, 2009.)

³⁵ *Google Comments* at 27.

hinder efficient network management and attenuate network investment incentives. The need for, and complexity of, wireless network management also makes it more likely that Commission regulation of network management will trigger those costs. Second, the competitive market structure reduces the potential benefits of regulation relative to the free-market outcome. As discussed above, competition provides incentives for service providers to adopt network management practices and business models that promote consumer welfare. It follows from these two facts that the costs of openness regulation are much more likely to outweigh the benefits when applied to wireless networks than to wireline networks.³⁶

A. ALLOW NETWORK MANAGEMENT

45. One of the widely recognized benefits of relying on competitive market forces rather than regulatory fiat is that regulators inevitably lack the information necessary to determine which supplier actions will maximize consumer welfare. The management of wireless networks is too complicated for the Commission or any other outside body to determine or define the most efficient practices. Wireless technologies are constantly changing, and network operators are investing billions of dollars in new facilities. Moreover, there are important interactions between technology, facilities investment, and network management, and these interactions vary over time and across network operators. The conclusion that the Commission is incapable of determining the welfare-maximizing approach to network management is not a criticism of the Commission. Rather, it is a statement about the difficulty of the task. This conclusion is also a clear indication that consumer interests are

³⁶ Because the present proceeding is limited to wireless services, I do not discuss here the many reasons to expect that the costs of regulation will outweigh the benefits when applied to wireline networks.

better served by allowing operators to choose their own network management policies and letting consumers choose which network providers best serve their needs.

46. This is not to say that wireless network operators will always make the right decisions. Like the Commission, network operators face a problem that is too difficult to solve with certainty. But that is another reason why it is important to rely on competitive market forces. Those network providers that through hard work or luck implement the most efficient network management practices will prosper. Those network providers that adopt inefficient network management practices will face pressures to change or suffer adverse commercial consequences. Any concerns about anticompetitive network management are better handled through the enforcement of antitrust laws than through proscriptive regulations.

B. LET SUPPLIERS CHOOSE THE FORM OF VERTICAL RELATIONSHIPS

47. As I discussed in my initial white paper, various forms of vertical contracting, including vertical integration and different forms of exclusivity arrangements can promote investment in both network infrastructure and complementary equipment and applications.³⁷ Vertical contracts provide a means for parties to commit to dealing with one another and, thus, such contracts can increase the incentives for the parties to invest in their economic relationship.

48. In its comments, Google calls on the Commission to take a more active role in mandating openness and thus determining the sorts of relationships various parties in the wireless ecosystem can maintain.³⁸ To support its viewpoint, Google cites what it sees as the

³⁷ *Katz Innovation White Paper*, § IV.C.

³⁸ *Google Comments* at 27.

salutary effects of the 700 MHz C Block auction on innovation and investment in the wireless market. In particular, Google’s comments attribute Verizon’s decision to open its CDMA network to third-party devices and applications and its subsequent Open Development Initiative (ODI) to the C Block auction.³⁹ The comments also cite Sprint’s and T-Mobile’s activities with the Open Handset Alliance and support for Google’s operating system, Android, as support for Google’s argument that the openness standards implemented as part of the C Block auction have led to greater investment and innovation.⁴⁰ Although Google asserts that all of these developments were, in part, caused by the Commission’s decision to require bidders for the C Block spectrum rights to maintain open networks, Google provides no analysis of whether these developments were, in fact, driven by regulation or competition.

49. Google further asserts that “these efforts are pushing at least some quarters of the wireless industry to re-think legacy closed business models.”⁴¹ As I noted in my initial white paper, competition between different business models is an important form of competition in the wireless industry.⁴² Although it may be true that some firms are rethinking their business models, there is no evidence that any particular model of an “open” platform is the only or best way to facilitate innovation and investment. For example, Apple’s iPhone is based on a managed model and its app store currently has approximately 85,000 applications available.⁴³ Public policies should not unduly restrict suppliers’ choices of business models and

³⁹ *Google Comments* at 28.

⁴⁰ *Google Comments* at 28 and 29.

⁴¹ *Google Comments* at 29.

⁴² *Katz Innovation White Paper*, § II.

⁴³ Apple, Inc., Press Release, *Apple’s App Store Downloads Top Two Billion* (September 28, 2009), available at <http://www.apple.com/pr/library/2009/09/28appstore.html>, site visited September 28, 2009.

organizational structure in the wireless marketplace. By far the most likely effects of public policies that impose sweeping restrictions on these choices will be to reduce innovation and investment, to consumers' detriment.

50. In fact, many of the examples cited by Google demonstrate the virtues of competition in the wireless industry. For example, Google notes that "Clearwire has the express and investment-backed goal to deliver precisely what the Commission and Congress have been striving for: the emergence of a wholesale alternative to the existing wireless incumbents."⁴⁴ It further notes that Clearwire has agreed to provide a relatively open network. This is a perfect example of competition in action. In 2008, Clearwire partnered with Sprint to develop a 4G wireless network based on WiMAX technology. Clearwire chose to develop a relatively open network because it believes that this openness will give it a competitive advantage. As Clearwire noted in its comments in this proceeding, "Clearwire adopted openness even in the absence of federal rules because openness is good for our business...[it] will increase network usage and revenues as our customers take advantage of a wide range of device and applications options."⁴⁵ Should Clearwire's business model prove to be effective, it will be rewarded by consumers in a competitive marketplace.

51. In support of its call for mandatory openness, Google argues that "[t]he end-to-end nature of the Internet is largely responsible for its brilliant success."⁴⁶ Although it is fashionable to make such a claim, the claim lacks a sound foundation. The Internet has been a

⁴⁴ *Google Comments* at 30.

⁴⁵ *Clearwire Comments* at 6.

⁴⁶ *Google Comments* at 30.

brilliant success, but there have been many contributing factors. And it is certainly conceivable that some relaxation of the end-to-end principle could have led to even greater success. Indeed, there is a vigorous debate about how Internet architecture and management can evolve to meet quality-of-service requirements and address other important aspects of supporting expanding uses of the Internet. Additionally, as discussed in my initial white paper, several managed ecosystems have facilitated very significant innovation.⁴⁷ As a general matter, pointing to a single example is a poor way to reach general conclusions (except to demonstrate that something is possible).

52. Another problem with Google's comments is that they appear to ignore the role of competition and its effects on wireless carriers' incentives to serve consumer interests. Specifically, the comments argue that innovative applications serving consumer interests will continue to be developed "only for as long as wireless applications innovators take their economic signals from consumers, and are not dependent upon the prior permission of the wireless platform owners."⁴⁸ This statement implicitly assumes that network owners will ignore the preferences of consumers. In doing so, this statement ignores the fact that almost all wireless consumers have a choice of service providers. This means that those wireless platform owners that work with application providers to provide the best overall consumer experience will succeed, and those platform owners and application providers that do not listen to consumers will fail. Here too, the competitive market structure in wireless reduces the potential benefits of regulation.

⁴⁷ *Katz Innovation White Paper*, § IV.D.

⁴⁸ *Google Comments* at 30.

53. In closing this discussion, it should be noted that more-open business models may prove to be the most successful at meeting consumer demands. However, this is not the only possibility. Consumers would not be well-served if the Commission imposed on the market what the Commission currently views as the best business model. Consumers are best served by public policies that allow carriers, application providers, and equipment manufacturers to compete using a variety of business models in order to see which model or models best succeed in attracting customers.

V. CONCLUSION

54. The Commission should employ a consumer-centric approach to policies that address wireless innovation and investment. A truly pro-consumer approach will lead to policies that rely primarily on competitive market forces to deliver innovation and investment with an antitrust and consumer protection backstop to correct situations in which the market can be shown to have failed. Those proposed policies that would promote undistorted competition merit serious consideration by the Commission. Those proposed policies that would distort competition or harm innovation and investment incentives should be rejected.

APPENDIX: QUALIFICATIONS

55. I hold the Sarin Chair in Strategy and Leadership at the University of California, Berkeley, where I serve as Director of the Institute for Business Innovation and have a joint appointment in the Haas School of Business Administration and the Department of Economics. I have also served as the Harvey Golub Professor of Business Leadership at New York University's Stern School of Business and on the faculty of the Department of Economics at Princeton University. I received my A.B. from Harvard University *summa cum laude* and my doctorate from Oxford University. Both degrees are in Economics.

56. I specialize in the economics of industrial organization, which includes the study of antitrust and regulatory policies. I regularly teach courses on microeconomics and business strategy. I am the co-author of a microeconomics textbook, and I have published numerous articles in academic journals and books. I have written academic articles on issues regarding the economics of network industries, systems markets, antitrust enforcement, and telecommunications policy. I am recognized as one of the pioneers in extending the theory of network effects to competitive settings. I am a co-editor of the *Journal of Economics & Management Strategy* and serve on the editorial boards of *Information Economics and Policy* and the *Journal of Industrial Economics*.

57. In addition to my academic experience, I have consulted on the application of economic analysis to issues of antitrust and regulatory policy. I have served as a consultant to both the U.S. Department of Justice and the Federal Communications Commission on issues of antitrust and regulatory policy. I have served as an expert witness before state and federal

courts. I have also provided testimony before state regulatory commissions and the U.S. Congress.

58. From January 1994 through January 1996, I served as the Chief Economist of the Federal Communications Commission under the Clinton Administration. I participated in the formulation and analysis of policies toward all industries under Commission jurisdiction. As Chief Economist, I oversaw both qualitative and quantitative policy analyses.

59. From September 2001 through January 2003, I served as the Deputy Assistant Attorney General for Economic Analysis at the U.S. Department of Justice under the Bush Administration. I directed a staff of approximately fifty economists conducting analyses of economic issues arising in both merger and non-merger enforcement. Our principal professional focus was on understanding and projecting the impacts of various business practices and public policy decisions on consumers' economic welfare. My title as Deputy Assistant Attorney General notwithstanding, I am not an attorney.